# AMATEUR TELEVISION QUARTERLY

VOLUME 9 #2
SPRING 1996

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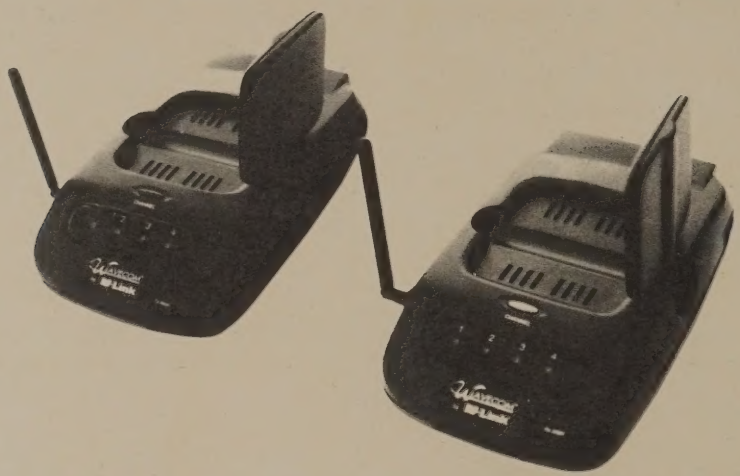

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# AMATEUR TELEVISION QUARTERLY

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## *COVER PHOTO*

Cover photo courtesy of Gordon West.

Paul Leib at his mountain top DX site.

## *NEXT ISSUE*

The TRUTH about vertical antenna gain specs. Don't buy an antenna till you read this!

Authors guide: Send in something legible. If you can do it in typewritten (computer print out) form in a laser text great, dot matrix is OK too. You can send it by E-mail to ATVQ on America OnLine, or via the US Snail to ATVQ 3 N Court St., Crown Point, IN 46307. If you send a computer disk, have it formated to an IBM (dos) machine, not Mac. If possible use WordPerfect, any version, or something that will convert. Diagrams should be clear, on plain paper (not lined) not Xerox copies. Photos can be color or black and white. If you have spell check, use it. Since this is a one person philanthrophic effort we do not pay for material. If you want a free subscription in exchange or if I can find any Test Pattern mugs you can have one of those. ATVQ accepts all material at the authors risk. Indicate if you want any of it back. ATVQ also accepts and may publish any mail it receives via its electronic mailboxes. We publish the authors information as it is on the E-mail header. We try to be as accurate as any other publication, but sometimes we are as bad as the others too. Most material is done in WP 5.2 and layout is in PageMaker. 5.0

Because my TV station work schedule starts at 7 am to 7-9 PM, and most weekends lose at least one day to remotes and other broadcast stuff at my real life job, the best way to "talk" to me is via E-mail or fax, lastly the answering machine. I get to it about once a week. You can also find me at home typically Sundays between 10 and 4 if I'm not working, or Saturday 9 to 3 if I am not working. That's how life is these days. 73 Henry KB9FO

## *CONTENTS:*



This issue was sent to the printer April 27, 1996. The deadline for the next issue is June 15, 1996. Your feed back is important. Please take a moment and send in your thoughts. The IN box is empty again! Send in your articles and news for the next (Summer) issue. See you at Dayton! (walking around)

## *DAYTON 96*

SSTV get together: Holiday Inn North, Friday night & PM. ATV Forum: Saturday 3 PM- 5PM, Room 3

# DISABLING AFT & MANUAL TUNING A QUARTZ TV

*David Staehling, AA0EN*

I am lucky to have had a Sony KV20XBR set for the past 10 years. Its performance has been great without a failure & I've enjoyed having remote switched video & antennas. For most of that time I was unaware that channel selection involved anything more than selecting the fixed optimum frequency. It was not until I started UHF TV Dxing and working ATV that I discovered the Auto Fine Tuning (AFT) function and what a nuisance it can be.

## The Problems with AFT:

1. If a signal is in a fade or the antenna is not aimed correctly when you select a channel, the AFT will search for and lock on to the spill over from a strong channel close in frequency. It is necessary to keep commanding the desired channel until you hit it when the signal is strong enough for the AFT to capture and lock. Another tactic is to disconnect the antenna, select the station, wait a few seconds for the set to default to center & then connect the antenna.
2. I've had trouble when testing VCRs with modulator output on channel 3. The set wants to lock on to local channel 4. Similar problems are apt to occur with ATV down converters. Another converter problem is that the TV will be chasing a moving target & your IF will be constantly changing. If you are lucky enough to live far from strong broadcast stations this probably doesn't matter, but generally the IF should be fixed after choosing the one that gives the best rejection of local signals. A useful tactic is to turn on the TV and let it default to center before turning on your converter.
3 When working via our repeater I would return from transmit to receive and about half the time the repeater was no longer tuned in. Obviously it tried to tune into my transmitted signal 13 Mhz higher.
4. When I searched for 439.25 Simplex on cable channel 60, the receiver would chase after packet or FM. After a

burst of interference I had no confidence that I was still receiving 439.25 Mhz correctly.

Having explained the problems with AFT let me explain why Sony & other manufacturers included it in Quartz synthesized sets. It is NOT necessary for any broadcast stations as they only offset +/- 10 Khz. The real reason is that some cable systems use converters without crystal control to translate stations from cable channels to normal broadcast channels. Also the modulators that are in VCRs, video games, computers, etc. do not as a rule have crystal control or manual fine tuning.

### Advantages of Manual Tuning:

Getting rid of the AFT was the biggest improvement that I needed and doing that was very easy, but I also had to have manual tuning because our repeater at 426.25 is offset down 1 Mhz from cable channel 58. Manual tuning is pretty advantageous in weak signal work. If a signal is on the verge of popping into color I can tune the receiver just a little higher to raise amplification of the color subcarrier. If a signal is very weak I can tune a little lower to reduce snow at the expense of video detail, which is too weak to use anyway. Most modern sets use IC synchronous detectors & sometimes they will not lock on a weak signal unless one fine tunes down. At times this may get one another 6 dB of sensitivity. A third benefit is that it is frequently helpful to tune a little bit higher or lower to escape interference from strong local stations.

## ANALYZING THE TV & HOW TO MODIFY IT: HERE IS HOW MY SET WORKS:

a. The AFT discriminator in IC201 references on two external adjustable tuned circuits, AFT & VIF. Discriminator output is 0 at 45.75 Mhz, the Video IF frequency.
b. If the received IF signal is above 45.75 Mhz, IC201 pin 6 goes high (+5 V) and pin 5 goes low (0).
c. If received signal is below 45.75 Mhz, pin 5 goes high and pin 6 goes low.
d. If the AFT is working, the +5 causes the controller and synthesizer to step in 125 Khz increments until both pins 5 & 6 are low. At that point it seems to stay put. (Unless I transmit!)
e. There is a limit of about 16 steps down for a total of 2.00 Mhz maximum negative offset tuning.
f. There is a limit of about 21 steps up for a total of 2.6 Mhz maximum positive offset tuning.
g. If the signal is too far removed, the discriminator never gets happy and the processor ratchets back to channel center & searches again. It does this quite rapidly several times, but in a few seconds it gives up & goes to center.

Expect other sets to vary in step size, end stops, & other details. I had to measure the above by setting a signal generator so the discriminator was zeroed and then counted the generator. The signal out of the synthesizer is far too weak for a counter, even with a 30 db amplifier.

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# DISABLING AFT & MANUAL TUNING A QUARTZ TV

## Circuit Discussed:

This is not the simplest way to do the job. I was driven by a desire to make it such that I could later tie into unused remote control functions. Also the wired VCR remote control that I used had only 5 wires to work with. The 4016 IC works as a relay & keeps leads short so the controller is less apt to be glitched. The transistors called out are very non-critical. Most any NPNs will work for the LED drivers and most any PNPs will work for the stepping switches. The diodes are there because I was afraid that putting 5 volts back into IC201 would damage it. Most any diodes will work.

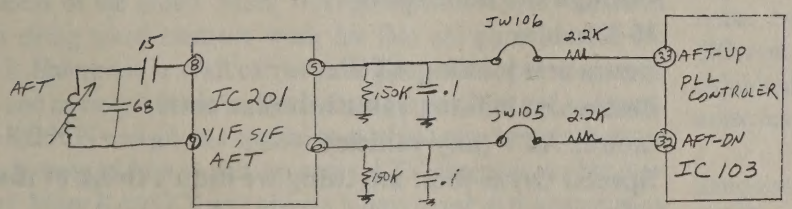
## Installation:

The circuitry is constructed on a 1.25 by 2.0 inch piece of perf. board. It is mounted to the plastic frame near the IF shield using a self tapping screw. The cable for the remote is hard wired to the board and exits through a hole I drilled in the bottom of the set. I drilled another hole on the right side and near the bottom & mounted a miniature toggle switch for Manual/Remote switching.

## Using the Control:

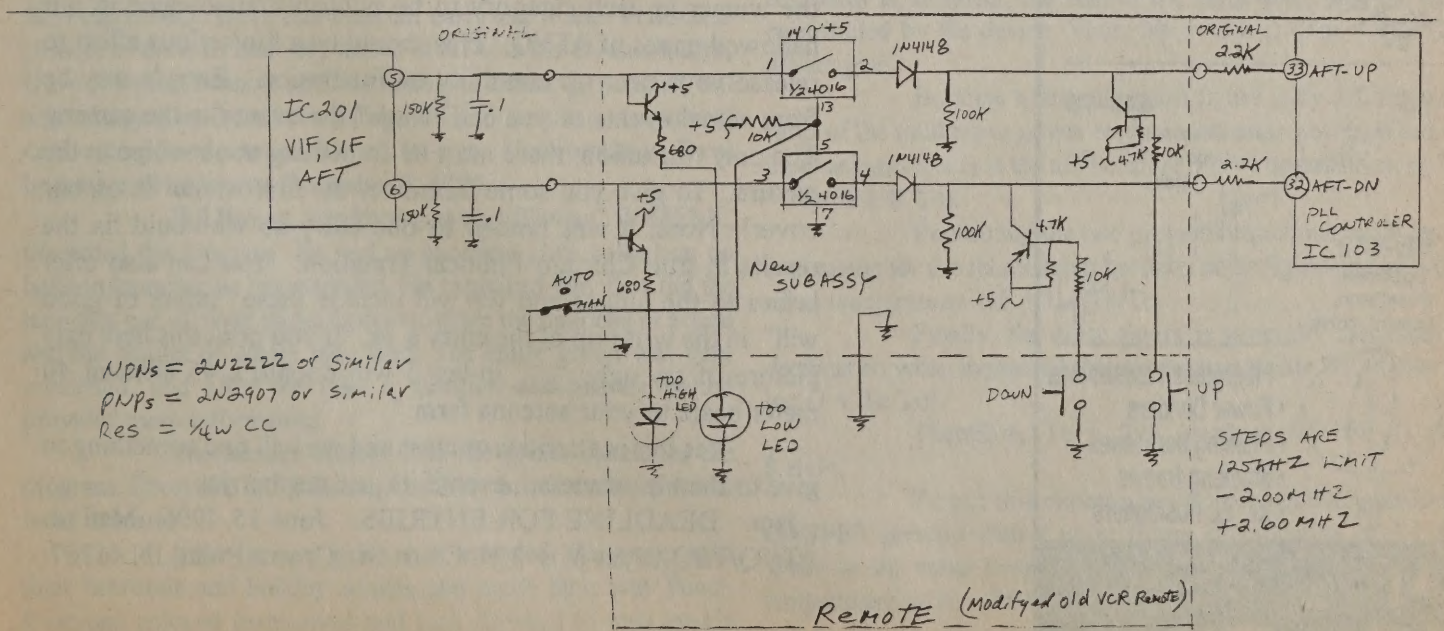
The button dwell time is important. If too short the controller will not step, but if too long you will get multiple steps. When you go one too many steps the synthesizer will hunt for a few seconds and then go back to channel center. The LED indicators are handy as a tuning indicator, but also tell you whether interference bursts are above or below the channel selected.

2-13-96
AADEN




MANUAL TUNING MOD.
FOR SONY KV-20XBR TV

ABOVE UNMODIFIED TV
BELOW AS MODIFIED




NPNs = 2N2222 or Similar
PNPs = 2N2907 or Similar
Res = ¼w CC

STEPS ARE
125KHZ LIMIT
-2.00MHZ
+2.60MHZ

# ATV Winter Olym-pics CONTEST!!

(or summer Olym-pics for you folks in Florida and southern California 'cause you never have one of our winters!)

**Categories:**

**Best... or worst...**

**minicam operator**
**Antenna erection**
**repeater operation**
**home studio**
**out door sport**
**in door sport**
**through the door sport**
**H-T holder**
**best/worst looking ATV'er**
**best/worst looking cable installer/cutter**
**mobile ATV (any vehicle)**
**Special Olym-pics: anything we didn't think of that is special to you!**

Rules: Anyone can enter! Enter as often as you want. Submit your entry in photo form, or video form. or film form, or in bad form! Our sex starved judges after a few 807's will choose the winner in each category to be published/announced in our hallowed pages of ATVQ. This should be a fun/serious effort to release your pent up creativity or frustration. Entry's may be from actual events or you can "stage" the event for the camera. The only restriction, there must be something about video in the picture. To give you some incentive, the first winner in on our cover! Note: it was limited to one entry so we could fix the results in true Chicago Political Tradition. You can also offer bribes to the judges and we will include these "offers of good will" in the write-up of the entry's. ie: "If you print this here ugly picture of my ugly ____ in-law I will donate a 45 element 40 meter beam to your antenna farm."

Yes this is a serious contest and we will find something to give to the top winners....even if its just raspberries ...jam. DEADLINE FOR ENTRIES: June 15, 1996. Mail to: ATVQ/TSQ Olym-pics 3 N. Court St., Crown Point, IN 46307.

# 1995 NINTH ANNUAL ATV BANQUET LITCHFIELD, ILLINOIS

Thanksgiving weekend not only marks the beginning of the Christmas season, but also the annual banquet for the Central Illinois/St. Louis Area ATV Club. A group of dedicated Amateur Television Operators met that night for an evening of fellowship and fun. The ninth annual Central Illinois/ St. Louis Area Amateur Television Club Banquet was held at the Ariston Restaurant in Litchfield, Illinois with over 50 members attending.

Activities began at 5:00 p.m. with old and many new members making and renewing acquaintances during happy hour. With special Christmas decorations added by Kathy WB9QLY and niece Amy Bishop, holiday fellowship and friendship was in full gear.

At 6:30 p.m. K9SM called the banquet to order beginning with a prayer by Cindy N9GNZ. Following the prayer the clatter of utensils and plates mixed with the chatter from the various tables was heard and a delicious meal was enjoyed by all.

This year's program began with special awards for members of the group. Mark WA9SXK, who recently returned from doing some contract work for this company aboard the U.S.S. Enterprise aircraft carrier, was given some special sea sick pills and an emesis basin in case he became sick if he had to return. Ron KD9CN was given a special book about television in the tube days to remind him to put up some ATV antennas on his new tower. Mark KA9SZX was given a pillow to use at the banquet as he had left Florida Friday and drove to Litchfield, Illinois so he could attend the banquet.

The fifth annual Central Illinois/St. Louis Amateur Television Operator plaque was awarded to Dave Williams from St. Peters, MO. Dave has been an early ATV and VHF/UHF pioneer in the area and very active in ATV in the St. Louis area. Dave contracted cancer and was unable to attend the banquet, but a special prayer was said by Cindy N9GNZ for him and a get well card was passed around for all to sign. Unfortunately, Dave became a silent key on December 8, 1995.

Bill Brown, also known as the "Elkman" WB8ELK, presented the program. He had an excellent slide collection on balloon launches he has attended. He explained why they did the launches and showed slides to demonstrate the balloons in action and the results of where they land. The entire group was very interested, and after the talk, a question and answer period provided more information.

The famous double draw for prizes concluded the program. Everyone looks forward to these prizes awarded to the lucky winners.

After the last price was awarded, the group said their farewells and holiday wishes and made their way home. Everyone enjoyed themselves and look forward to next year's banquet. Further information or questions should be directed to: Central Illinois/St. Louis Area ATV Club, Scott Millick K9SM, 907 Big Four Avenue, Hillsboro, Illinois 62049, 217-532-3837

# RELATING NOISE FIGURE TO NOISE TEMPERATURE

**Bill, W8DMR**

Johnson noise, defined as a non-periodic AC voltage fluctuation, and in reality an effect of electron agitation, places a limit on the ultimate sensitivity of amplifiers, mixers, and preamplifiers. All high frequency transistors, whether FET or bipolar devices, as well as all passive elements, reach a well defined performance based on this effect.

Historically, transistors have been categorized by their noise figure (NF). The lower the noise figure, the better the device. But, two decades ago within the confining technology of ultraflow noise parametric amplifiers and hydrogen masers, another measure of performance was developed. This parameter, termed noise temperature, has established industry acceptance.

What does noise temperature really mean? Also, how does one convert from noise figure specifications to noise temperature specifications to make comparisons?

At absolute zero, -273.18 deg. C., Brownian movement (hence electron agitation) ceases, and Johnson noise equals zero. Normal room temperature is generally regarded as 20 deg. C. Universal scientific consent has established the standard noise transistors, however, can exhibit noise temperatures different from their operating or ambient temperatures. This exhibited noise temperature is termed the device's effective input noise temperature (TE).

Another relevant term in understanding noise temperature, input available noise power (P), is calculated as $P = k T B$, where k is Boltzmann's constant ($k = 1.38 \times 10^{-23}$); B is bandwidth in hertz; and T is absolute temperature in degrees Kelvin.

The total noise output power (Np) of an active transistor is, in effect, the sum of the input noise plus the noise contributed by the device. Thus: $Np = G k B (Tin + Te)$. G is device gain.

Because a device's noise figure is by definition the ratio of the total noise power to the input noise power, when the input termination is at the temperature of 290 degrees Kelvin, $NF = Np/(G k B To)$.

Combining the two previous equations produces an expression for the relationship between noise figure and effective noise temperature: $NF = 1 + Te/To$.

Finally, the noise figure is generally expressed in decibels so when expanded this expression yields $NF (dB) = 10 \log (1 + Te/To)$.

Therefore, $Te = 290$ (antilog (NF/10) -1) deg. Kelvin.

To put this expression into perspective, consider a GASFET preamp with a noise figure specification of 2.7 dB. What is its noise temperature? Answer: The effective noise temperature is Te = 250 deg. Kelvin.

# TECHNICAL CONSIDERATIONS OF AMATEUR FAST SCAN TELEVISION IN THE EXISTING 70 CM BAND PLAN

*Lyn H. Cyr*
*W1NRE*

### *Review of FCC Part 97 As It Applies to ATV*

With the latest revision of FCC Part 97 (Effective September 1989), one of the simplest but most significant rules was put into effect. The rule has become known as the "Good Amateur Practice" rule.

Para 97.101(a) In all respects not specifically covered by the FCC Rules each amateur station must be operated in accordance with good engineering and good amateur practice.

Para 97.101(a) Each station license and each control operator must cooperate in selecting transmitting channels and in making the most effective use of the amateur service frequencies. No frequency will be assigned for the exclusive use of any station.

It is in this light that the following presentation is made.

## *Legal Requirements and Restrictions*

Para 97.301 Authorized Frequency Bands
ITU Region 2 Sharing Requirements (97.303)
420-450 Mhz

(a) No interference to adjacent to regions or subregions.

(b) Shall not cause interference to nor is protected from interference of the government radio location service.

(f)1. (420-430) No transmissions north of A line.

2. 420-430 allocated on secondary basis, fixed and mobile primary

3. 430-440 allocated on secondary basis. Radio location primary

4. 449.75-450.25 no interference to space services

Para 97.305 Authorized Emission Types

(c) A station may transmit the following emission types on the frequencies indicated, as authorized to the control operator, subject to the standards specified in Para. 97.307(f) of this Part. 70 CM entire band MCW, PHONE, IMAGE, RTTY, DATA, SS, TEST (6,8) (data restriction of 100 Khz bandwidth)

(b) A repeater may receive and retransmit only on the 10 Mhz and shorter wave length frequency bands except the 28.0-29.5 Mhz. 50.0-52.0 Mhz, 144.0-144.5 Mhz, 145.5-146.0 Mhz, 220.0-220.5 Mhz 431.0-433.0 Mhz and 435-438.0 Mhz segments.

(c) Where the transmissions of a repeater cause harmful interference to another repeater, the two station licensees are equally and fully responsible for resolving the interference unless the operation of one station is recommended by a frequency coordinator and the operation of the other station is not. In that case, the licensee of the non-coordinated repeater has primary responsibility to resolve the interference.

## ARRL 70 CM Band Plan

**1. The Reason For Being**

"Band plans are not unilateral decisions made in a vacuum. Inputs from the ARRL VHF Repeater Advisory Committee (VRAC), the VHF/UHF Advisory Committee (VUAC) and other leading groups has led to the existing bandplans. Each plan is designed to promote the greatest spectrum efficiency possible.

All amateurs should make every effort to operating in concert with these plans, which have the approval of the ham community and the FCC. In fact, "good amateur practice" dictates compliance with these community standards" (ARRL "The FCC RULE BOOK", 1989).

**2. Current ARRL 70 CM Band Plan**

420-450 Mhz

The following band plan is currently under review by the ARRL VHF-UHF Advisory Committee.

420.00-426.00 ATV repeater or simplex with 421.25 Mhz video carrier, control links and experimental
426.00-432.00 ATV simplex with 427.250 Mhz video carrier frequency
432.00-432.070 EME (Earth-Moon-Earth)
432.07-432.08 Propagation beacons
432.08-432.10 Weak signal CW
432.100 70-cm calling frequency

432.10-432.125 Mixed mode and weak signal work
432.125-432.175 OSCAR Inputs
432.175-433.00 Mixed mode and weak signals
433.00-435.00 Auxiliary/repeater links
435.00-438.00 Satellite only (Internationally)
438.00-444.00 ATV repeater input with 439.250 Mhz video carrier frequency and repeater links
442.00-445.00 Repeater inputs and outputs (local option)
446.0 National Simplex Frequency
447.00-450.00 Repeater inputs and outputs (local option)

The following Packet Radio frequency recommendations were adopted by the ARRL Board of Directors in January 1988.

**100-Khz Bandwidth channels**

430.05, 430.35, 430.65, 430.15, 430.45, 430.85, 430.25 430.55, 430.75

**25-Khz Bandwidth Channels**

431.025, 441.000, 441.050, 440.975, 441.025, 441.075

**Current 70 CM ATV Channel Utilization**

The accompanying table shows the current utilization of the 70 CM band for ATV use. Of significance is the extensive use of 439.25 Mhz as an input to both in-band and cross-band repeaters. Since 1989, 434.00 Mhz is increasing in popularity due to the demands made between 440 and 442 Mhz. Manufacturers report that equipment sales are evenly divided between 426.25 and 434.00 Mhz. The most popular request remains 439.25 Mhz. Southern California has given up on 439.25 as in input. 434.0 Mhz as an input with cross-band outputs is prevalent. 426.25 Mhz is used as a simplex frequency. The choice of frequencies is somewhat predicated on existing commercial hardware.

| | |
|---|---|
| P.C Electronics | 439.25, 434.00 and 426.25 or 427.25 MHz Standard Frequencies |
| Wyman Research | 439.25 and 434.00 Mhz Standard Frequencies |
| AEA Electronics | 439.25 and 434.00 Mhz Standard Frequencies |
| TD Systems | 439.25, 426.25, 434.00 Mhz Standard Frequencies |

## Comments on the Existing Bandplan

Referring to the bandplan chart, the coexistence of ATV operations with other amateur services and its survival in the 70 CM band is in question. In the past ATV repeaters have coexisted with FM repeaters, but the inclusion of packet frequencies in the middle of planned ATV frequencies is unilaterally incompatible.

Packet operations on 438.425 Mhz, not per the existing bandplan, has resulted in one ATV repeater swapping its input and output frequencies in the spirit of "good amateur practice." (WR4AAG) This same packet operation is presently posing some operational problems with another ATV repeater with an input of 434.00 Mhz. Their audio input is at 438.5 Mhz. In the past, the FCC has placed the burden of problem resolutions on the uncoordinated repeater and on simplex stations.

The inclusion of packet operations and networks is vital to our fraternity but let's seek some technically sound solutions void of any emotions so that we may coexist. Only after an understanding of each other's technical requirement, can we arrive at some resolution.

## ATV TECHNICAL CONSIDERATIONS (TX, RX AND FILTERS)

1. Video is amplitude modulation
   a. Sidebands are dependent upon amplitude and frequency of modulating signal.
   b. 100% modulation produces sidebands con taining 50% of the carrier for a single tone. That is 25% power in each sideband.
   c. In practice and under complex modulating signals you can not 100% modulate all the possible sidebands at 100%.
2. The modulated TV signal (see Fig. 2)
   a. Conventional AM modulation - power increases with increased modulation (positive modulation).
   b. TV uses negative modulation - power decreases with increasing modulation.
   c. TV signal contains sync and video information.
      1. Sync pulses are DC square waves and have rise/fall times of 200 NSEC (5Mhz bandwidth).
      2. The fundamental frequencies are 30, 60 and 15734 Hz having harmonics all the way to 5 Mhz. The amplitude of these harmonics is typically 50 DB below carrier.
      d. Sync occurs 5/63 of the time (about 8% of the time).
      e. During black video only 75% of the power is generated.
      f. During white peaks only 12% of the power is generated.
      g. Average picture level is about 20% - 40% of peak power.
      h. Real life signal have sidebands that are 40 DB below carrier .5Mhz away from carrier - 50 DB at 1 Mhz - 60 DB or more at 2 Mhz.
      i. Color sidebands are 45 DB down from video carrier and more than 60 DB 1 Mhz away from video carrier.

## 4.VESTIGIAL SIDEBAND FILTERS

Current amateur filter techniques and financial considerations somewhat limit the use of vestigial sideband filters for the repeater user. The use of such filters, however, is mandatory for ATV repeaters. The filters are bandpass types which must pass 4.5 Mhz to within +/- .5 dB while at same time offer at least 50 to 60 dB of out of band rejection. Current insertion losses typically below 2 dB. No small task!

The function of the filter is two fold:

a. Prevent receiver desense from the ATV transmitter

b. Achieve Vestigial Sideband transmissions

j. Sound subcarrier is 4.5 Mhz away from video carrier and is typically 15 dB down from video carrier level. (Sound may be transmitted on a subcarrier or by using a separate FM transmitter 4.5 Mhz away from video carrier.)

### *3. Receiver Characteristics*

a. Receivers are wideband AM detectors.

b. Video to be recovered is typically 40 to 60 dB below the carrier and therefore interference needs only be 40-60 dB below the wanted signal to show up as interference.

c. Color is even more sensitive to interference. The receiver color detectors has a 3 Mhz bandwidth.

d. Because of vestigial sideband, the receiver provides an additional 6 dB boost for frequencies above 1.25 Mhz from the video carrier.

e. To have a perfect picture you have to have a carrier level 60 dB above the noise floor so that the weakest sidebands are at least 10 dB above the noise.

---

***Fig. 2 - Frequency spectrum of a color TV signal shown in diagram at (A) and on a spectrum analyzer at (B). Each vertical division represents 10 dB; horizontal divisions are 1 Mhz. Spectrum power density will vary with picture content, but typically 90% of sideband power is within the first megahertz.***

---

### *ATV BANDWIDTH IMPACT ON EXISTING & FUTURE FM REPEATERS*

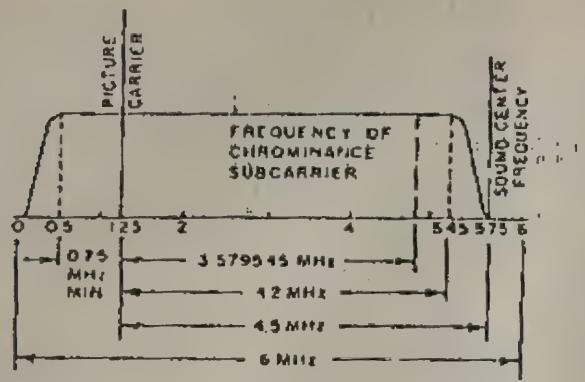
1.Sideband power impact on narrow band receiver inputs.An analysis of expected signal levels to an FM repeater or packet receiver input, as a function of ATV sideband power, was performed and tabulated on the following page.The following assumptions were made in this analysis:

a. Transmitter antenna gain is +10dB over dipole

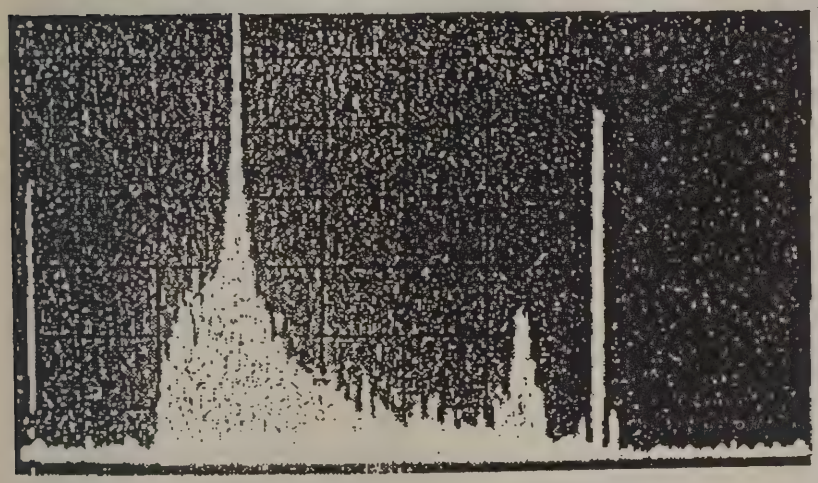
b. Transmitter filter and coax losses are 3 dB

c. Receiver antenna gain is +10dB over dipole

d. Receiver bandwidth is 15 Khz with a noise figure of 1dB




(A)



e. Both antennae are of the same polarization

f. Video transmitter has a peak power output of 100 watts.

g. Calculations are based on energy levels +/- 1 Mhz away from video carrier.

***2. Additional considerations***

a. Most ATV repeater are horizontally polarized and the predicted signal levels would be reduced by an additional 15-20 dB.

b. Signals +/- Mhz away from the video carrier would be reduced by an additional 10 dB.

***3. FM Receiver Advantage***

a. The effect of signal "capture" can be used to advantage during FM demodulation process. Signals 2 to 3 times wanted signal will get captured.

b. In normal usage, point-to-point links (remotes, controls, etc.) can have their design parameters such that the operating characteristics of the system can capture any signals which are not the result of ATV sideband energy.

## *ATV TRANSMITTER SIDEBAND IMPACT ON FM REPEATER INPUTS*

| | |
|---|---|
| Frequency | 439.25 Mhz |
| Distance | 1 mile |
| TX power | 100 watts |
| Sideband attenuation | 50 dB |
| Sideband power | 1E-03 watts |
| TX antenna gain | 10 dB |
| TX coax line loss | 3 dB |
| Path loss | 89.5 dB |
| Signal at RX site | 13.2 UV |
| RX antenna gain | 10 dB |
| RX coax loss | 3 dB |
| Min. RX sensitivity | -130.2 dB (23 uV) |
| Receiver noise figure | 2 dB |
| Receiver bandwidth | 15 Khz |
| Carrier/noise ratio | 50.5 dB |

| | |
|---|---|
| Frequency | 439.25 Mhz |
| Distance | 5 miles |
| TX power | 100 watts |
| Sideband attenuation | 50 dB |
| Sideband power | 1E-03 watts |
| TX antenna gain | 10 dB |
| TX coax line loss | 3 dB |
| Path loss | 103.4 dB |
| Signal at RX site | 2.6 uV |
| RX antenna gain | 10 dB |
| RX coax loss | 3 dB |
| Min. RX sensitivity | -10.2 dB (4.6 uV) |
| Receiver noise figure | 2 dB |
| Receiver bandwidth | 15 Khz |
| Carrier/noise ratio | 36.5 dB |

| | |
|---|---|
| Frequency | 439.25 Mhz |
| Distance | 10 miles |
| TX power | 100 watts |
| Sideband attenuation | 50 dB |
| Sideband power | 1E-03 watts |
| TX antenna gain | 10 dB |
| TX coax line loss | 3 dB |
| Path loss | 109.5 dB |
| Signal at RX site | 1.3 uV |
| RX antenna gain | 10 dB |
| RX coax loss | 3 dB |
| Min RX sensitivity | -130.2 dB (2.3 uV) |
| Receiver noise figure | 2 dB |
| Receiver bandwidth | 15 Khz |
| Carrier/noise ratio | 30.5 dB |

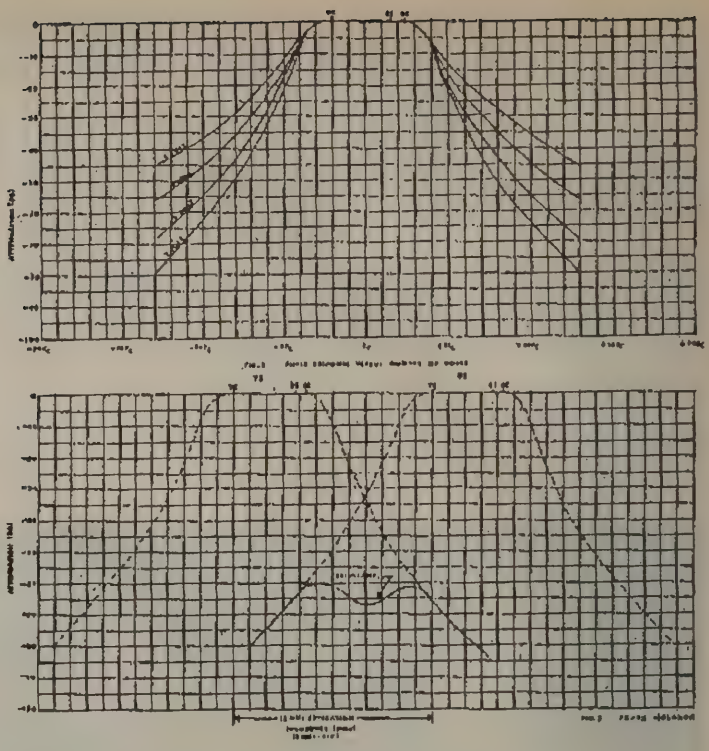
Frequency ..... 439.25 Mhz
Distance ..... 20 miles
TX power ..... 100 watts
Sideband attenuation ..... 50 d□DB
Sideband power..... 1E-03 watts
TX antenna gain ..... 10 dB
TX coax line loss..... 3 dB
Path loss..... 115.5 dB
Signal at RX site ..... .7 uV
RX antenna gain..... 10 dB
RX coax loss ..... 3 dB
Min RX sensitivity..... -130.2 dB (1.2 UV)
Receiver noise figure ..... 2 dB
Receiver bandwidth ..... 15 Khz
Carrier/noise ratio ..... 24.5 dB

Notes:
1. Video carrier at 439.25 Mhz
2. Sidebands located at +/- 1 Mhz from video carrier
3. For sidebands +/- 2 Mhz away, levels would be an additional 10 dB lower.
4. 100 watts is worst case. Typical power levels for 100 watt amplifier is about 60 watts sync tip level.

## *FM TRANSMITTER IMPACT ON ATV RECEIVER RECEPTION*

1. The television IF frequency response
a. Notice that the video is placed at the 50% point to compensate for vestigial sideband and that frequencies above the main carrier get additional gain.
b. Also shown are the relationships of existing packet frequencies to the IF response. Interfering frequencies get amplified more than the main video carrier.
c. As mentioned earlier, interference needs only be 40 to 60 dB below the carrier level to cause objectionable interference.
2. FM Transmitter signal levels at ATV receiver inputs
a. Shown below are calculations of expected signal levels at an ATV receiver input. The following assumptions were made:
1. Transmitter power output is 10 watts with essentially no antenna gain.
2. ATV receiver has a net antenna gain of 4 dB and a 4 Mhz bandwidth.

***[Editor's note: Keep in mind that any carrier that is within the passband of the TV receiver and is stronger than the weakest detectable sideband of the video will interfere with the video. Carriers more than 10 dB above the sidebands will make the picture generally unviewable!]***

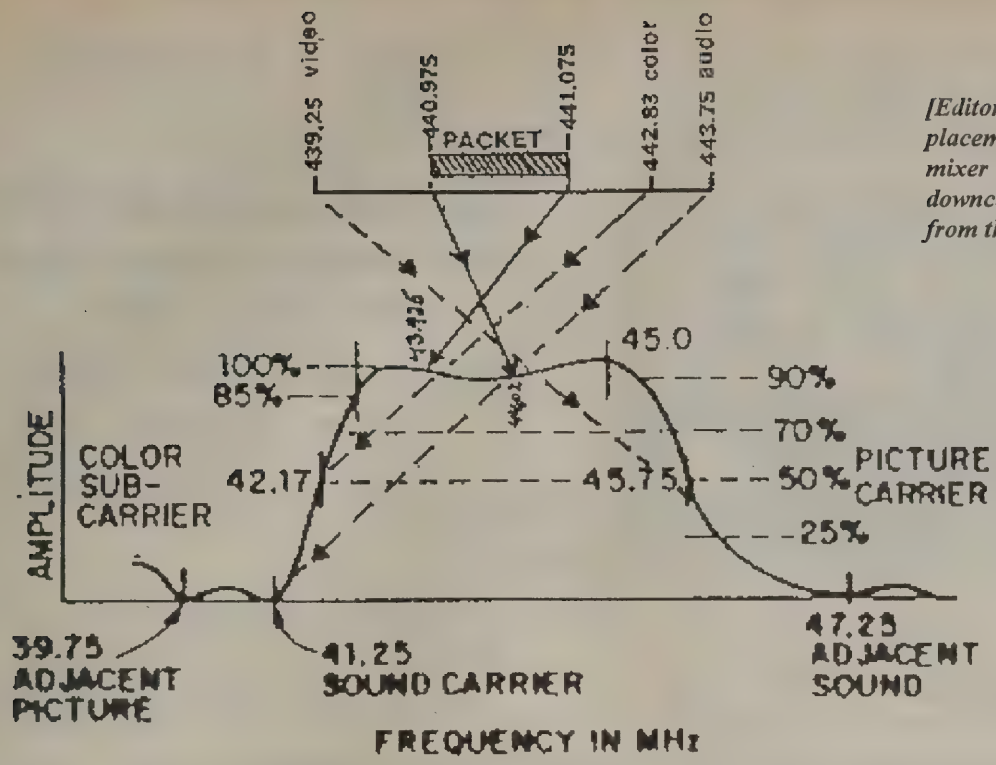


***Typical tx-rx duplexer response***

***[Editor's note: For less than snow free reception, any signal above the noise floor of the receiver will cause interference. This is typically 1 microvolt, as 1.1 uV is generally the noise floor for a video bandwidth signal.***

Frequency ..... 442 Mhz
Distance ..... 5 miles
TX power ..... 10 watts
TX antenna gain ..... 3 dB
TX coax line loss..... 3 dB
Path loss..... 103.5 dB
Signal at RX site ..... 117 uV
RX antenna gain..... 6 dB
RX coax loss ..... 2 dB
Min RX sensitivity..... -106.4 dB (144.7 UV)
Receiver noise figure ..... 1.6 dB
Receiver bandwidth ..... 4000 Khz
Carrier/noise ratio ..... 42.6 dB

Frequency ..... 442 Mhz
Distance ..... 10 miles
TX power ..... 10 watts
TX antenna gain ..... 3 dB
TX coax line loss..... 3 dB
Path loss..... 109.5 dB
Signal at RX site ..... 58.5 uV
RX antenna gain..... 6 dB
RX coax loss ..... 2 dB
Min RX sensitivity..... -106.4 dB (72.4 UV)
Receiver noise figure ..... 1.6 dB
Receiver bandwidth ..... 4000 Khz
Carrier/noise ratio ..... 36.6 dB




*[Editor's note: this diagram shows the placement of signals when the first local mixer (tv set mixer not ham downconverter) inverts the sidebands from the RF to IF frequencies]*

| | |
|---|---|
| Frequency | 442 Mhz |
| Distance | 20 miles |
| TX power | 10 watts |
| TX antenna gain | 3 dB |
| TX coax line loss | 3 dB |
| Path loss | 115.5 dB |
| Signal at RX site | 29.2 uV |
| RX antenna gain | 6 dB |
| RX coax loss | 2 dB |
| Min RX sensitivity | -106.4 dB (36.2 uV) |
| Receiver noise figure | 1.6 dB |
| Receiver bandwidth | 4000 Khz |
| Carrier/noise ratio | 30.6 dB |

### *434.00 MHZ AS AN ATV REPEATER INPUT*

Frequency coordinating committees have been reluctant to coordinate 434.00 Mhz in the past because of strict interpretations of the FCC rules and not fully educated in ATV matters. The following comment are "snap shot" views on the subject.

1.Mike Lamb, N7ML (Pres. AEA)

"...please understand that in the Northwest we are limited because of the 'A' line and FM repeaters above."

2. Henry Ruh, KB9FO (Publisher ATVQ)

"In southern California where 434 Mhz is the coordinated ATV frequency..." "Outside of southern California, 434 is used mostly as an escape from interference caused by FM mode packet, FM mode repeaters operating at 438-444 Mhz."

3.Tom O'Hara, W6ORG (Pres. PC Elect, ARRL Technical Advisor, SCRRBA Technical Committee)

"The fact is that 434.0 ATV, 432 weak signal and satellite activity has operated and has been coordinated in Southern California for over 15 years." The SCRRBA technical committee ran some tests on 434.00 Mhz and concluded:

"We found that ATV on 434 did not interfere with 432 or 435 Mhz reception unless the two stations were within about 5 miles and the antennas were pointed at each other."

"A test was made to simulate a 70 CM satellite pass by Dr. Norm Chaflin, K6PGX and Booth Hartley, N6BH, of JPL Radio Club, in his Beech Bonanza aircraft. As he flew from Santa Diego to Santa Maria, various satellite enthusiasts tracked and copied his signals. At the same time ATVers would point their beams at the stations. Again in only one case where the ATVers were within one mile was there interference."

"The ground work for utilizing 434.00 Mhz for an ATV repeater input has been laid down by others. The FCC is fully cognizant of this matter and applies the 'good amateur practice' interpretation of its rules."

## *Summary*

### *A .Highlights*

1. Fast Scan Television is an authorized mode on 70 CM.
2. ATV Repeater operations are permitted.
3. The ARRL 70 cm Packet band plan is ill advised and without due recognition of its own band plan.
4. Existing ATV band plan essentially makes ATV repeaters on 70 cm impossible due to the multiple services

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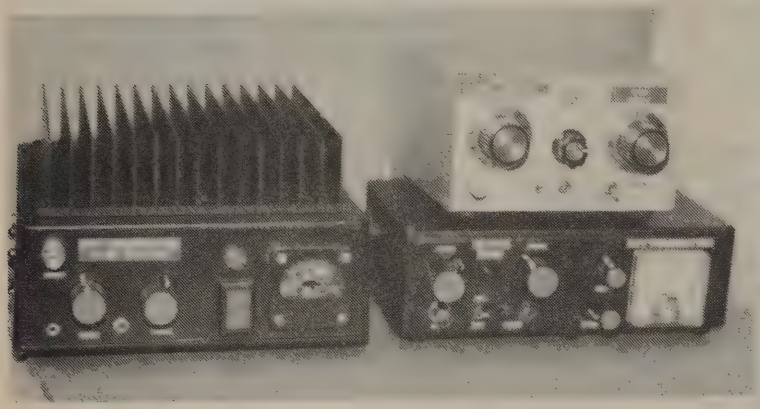

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split with existing filters. Present plan does not recognize that need.
5. 439.25 Mhz is the national preference with a gradual shift to 426.25 Mhz and 434.00 Mhz with cross-band outputs.
6. ATV operation is not as frequency demanding as it seems.
7. ATV repeater outputs can coexist with other amateur services using the same frequencies.
8. Interference to ATV operations is much more severe from existing narrowband operations.
9. ATVers make efficient use of the spectrum for the mode being utilized.
10. 434.00 Mhz is a viable ATV frequency.
11. Industry recognizing ATV as a developing new facet of amateur.
12. Provides high visibility at public demonstrations arousing interest in prospective new hams.

## B. Suggestions

### *COEXISTENCE*

FM and Packet operations can coexist with ATV repeater outputs. The WINRE ATV repeater has been on 439.25 Mhz output for the past eight years. NO INTERFERENCE from other amateur services has come to its attention.
ATV repeater output must utilize a vestigial sideband filter and limit its beacon operations.
FM and Packet operations can use "PL", cross polarization, and take advantage of the FM "capture" effect for some protection.
FM and Packet operations does not preclude the use of narrow bandpass filters.
Control links and auxiliary operations must use minimum power and the use of directional antennas to meet their objectives.
ATV and narrow band operations should be cross polarized.
Where possible, assign FM repeaters with their inputs in the 440-444 segment keeping in mind that the video, color and audio subcarriers are prime "hit" frequencies.

### *Cooperation*

Designate a recognized two meter calling frequency for coordinated "quiet hours," cooperation, etc. (144.34 Mhz) during contest, public events, emergency operations, etc.
ATVers have always accommodated other amateur users in their request for cooperation. Never the other way!
ATVers may consider time slot assignments for ATV casual net operations.

### *BandPlan*

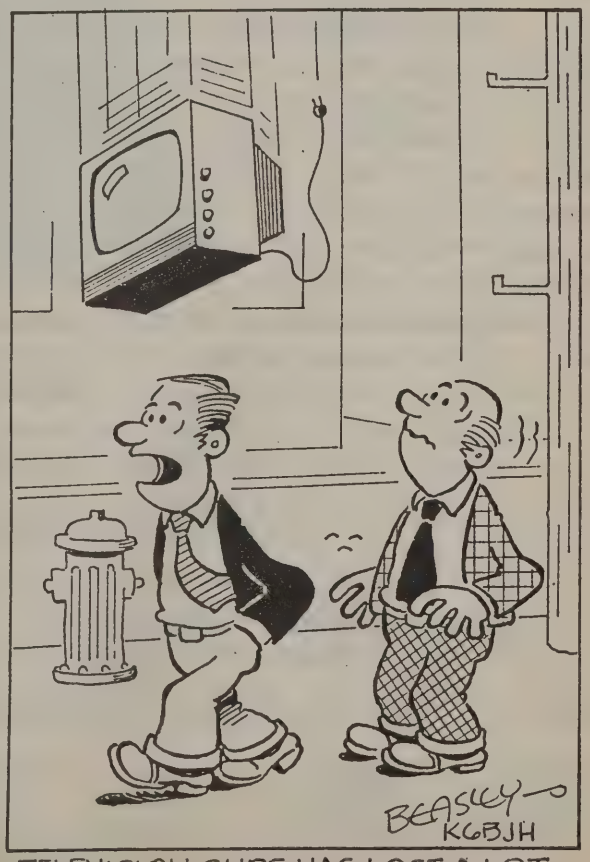
Move 427.25 Mhz to 426.25 Mhz as a video carrier. The subcarrier audio of the 427.25 video carrier spills over into the weak signal portion.
Move packet assignments in the 426 Mhz portion to the 420 segments. Keep packet operations on the outputs of ATV repeaters.
Keep packet operations, where they must share, 2.5 Mhz above the video carrier to minimize sideband interference to the packet stations.
Relocate 438.425 Mhz Packet operations.
Allow repeater inputs on 434.00 Mhz.

### *The Future*

Recognizing the need for more 70 cm narrow band spectrum space, allow sufficient time for implementation of 70 cm to 23 cm cross-band plan. Packet operations, because of their point-to-point operations, should investigate the use of 23 cm for networking and use of higher baud rates.

ATVers in Connecticut are currently studying the 23 cm band as intercity links and cross-band operations. The use of 70 cm should be relieved somewhat but the need for 70 cm as input will still exist. A reasonable time frame is about 2/3 years.

***[ Editor's note: The author wrote this in 1991, it is still true today!]***




TELEVISION SURE HAS LOST A LOT OF ITS IMPACT IN RECENT YEARS

# HIGH LEVEL MODULATOR FOR ATV

It started out to be a routine change of the tube in my 4CX250 ATV transmitter. The output was very low and after over ten years of faithful operation, I wasn't too disappointed that it needed replacement. However, when I installed a brand new one in place of the one I believe I bought at a hamfest for under ten bucks, things didn't work quite right. Instability, oscillations and poor video reproduction were among a few of my surprises. At that point it seemed natural to blame the video modulator, but from where I sit now, for the life of me, I can't figure out how I came to that conclusion!

My existing video modulator was build by myself in the sixties from a circuit design by Mike Talent. This circuit seemed to perform well until I converted from black and white to color. Then I realized that to transmit color I needed to include the color burst too. The poor video response (about 2 Mhz) was responsible, so I cobbled up the circuit and with the help of negative feedback, I was able to boost it enough to be acceptable. While I had the transmitter apart that seemed to be a good time to redesign it. Here goes!

The circuit shown on the following page is very similar to the original which is basically a good design. My circuit improves the gain, video response and the range of adjustment, allowing a wider variety of tube parameters t be accommodated. DC coupling is desirable throughout but sometimes it is not feasible. AC coupling was used on the input stage because the video comes from a remote source with grounds that may differ from this one. A video op-amp with current feedback was chosen for the first stage to keep it simple while maintaining a wide bandwidth at high gain. A gain of ten was selected because that was the practical limit in that device and that much was needed to allow low gain operation of the following transistor stages. The feedback resistors R1 and R2 must not only maintain a ratio of 10:1 for a gain of 10 (R1/R2=1000/100=10) but also must be low value units (below 1K ohms) to maintain wide bandwidth characteristics. Since this op-amp has a maximum voltage rating of 25 volts, a voltage divider and filter was used derived from the -150 volt main supply as shown in the schematic. The video output from the op-amp is then DC coupled the next stage.

The next stage is a simple transistor circuit. A PNP transistor is needed here to perform the required DC level shift. This circuit is sensitive to stray capacitance so it is imperative that leads be kept short to preserve the bandwidth. Some stray capacitance is unavoidable, however, so some high frequency peaking is usually required. The 33 pf capacitor across the 1k emitter resistor restores the slight high frequency roll off to a flat condition to out past 6 Mhz, but the value may change with various circuit layouts. I recommend the user check the color burst amplitude of the transmitted and detected video at the transmitter output and select a value to provide the correct amplitude (see my line sampler circuit in the April 1995 issue of ATCO newsletter). This transistor has a gain of 3.3 which is determined by the ratio of the collector and emitter resistors. The inverted video signal at the collector is then passed to an emitter follower buffer transistor (unity gain) to prevent collector loading and loss of high frequency signals by the next circuit.

The input network of Q3 is a variable DC bias adjustment to set the DC operating point of the output and control the 4CX250 tube bias commonly referred to as the pedestal adjustment. The video has to be AC coupled at this point so it will "ride on top of" the DC bias. IMPORTANT. The diode in this circuit must be a fast switching type. Use a 1N4936 or similar. A standard 1N4004 will not be fast enough to follow the video properly. This transistor circuit has a gain of 5 (5000/1000) which is higher than required for the signal but needed to allow the DC portion of the output to be adjusted to within 25 volts of the power supply (-125 volts). This transistor also serves as the differential driver for the following two transistors.

The output transistor complementary pair Q4 and Q5 works quite well to drive the 4CX250 grid because it is a very low impedance circuit capable of driving high capacitance without bandwidth degradation. It accomplishes this because it is essentially an active driver for both positive as well as negative going signals. This is unlike Q1 which is only active in the ground driven direction and passive in the power supply direction (pulled to -150 volts by the 3.3k resistor).

The overall frequency response of the total circuit is essentially flat from about 20 Hz to over 4.5 Mhz, where rolloff starts. Useable bandwidth is beyond 8 Mhz where it is only about 3 dB down at 6 Mhz. I have noticed some small phase distortion starting at around 4 Mhz, but it is not serious. After I have more time to play with it, maybe it can be improved upon. I'll publish improvements in future

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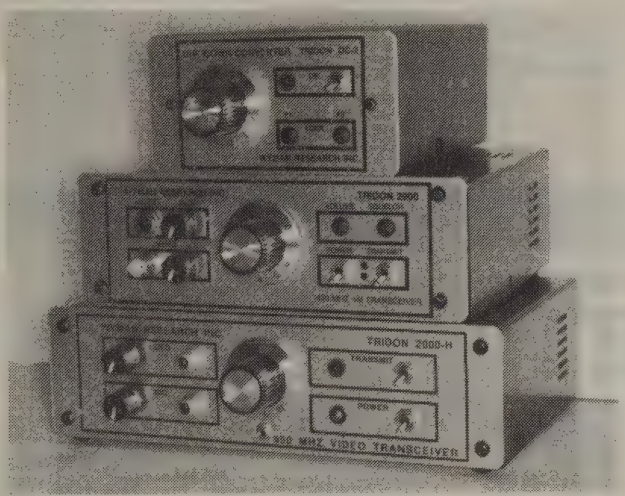
| **DC-2** |  | **$109.95** |
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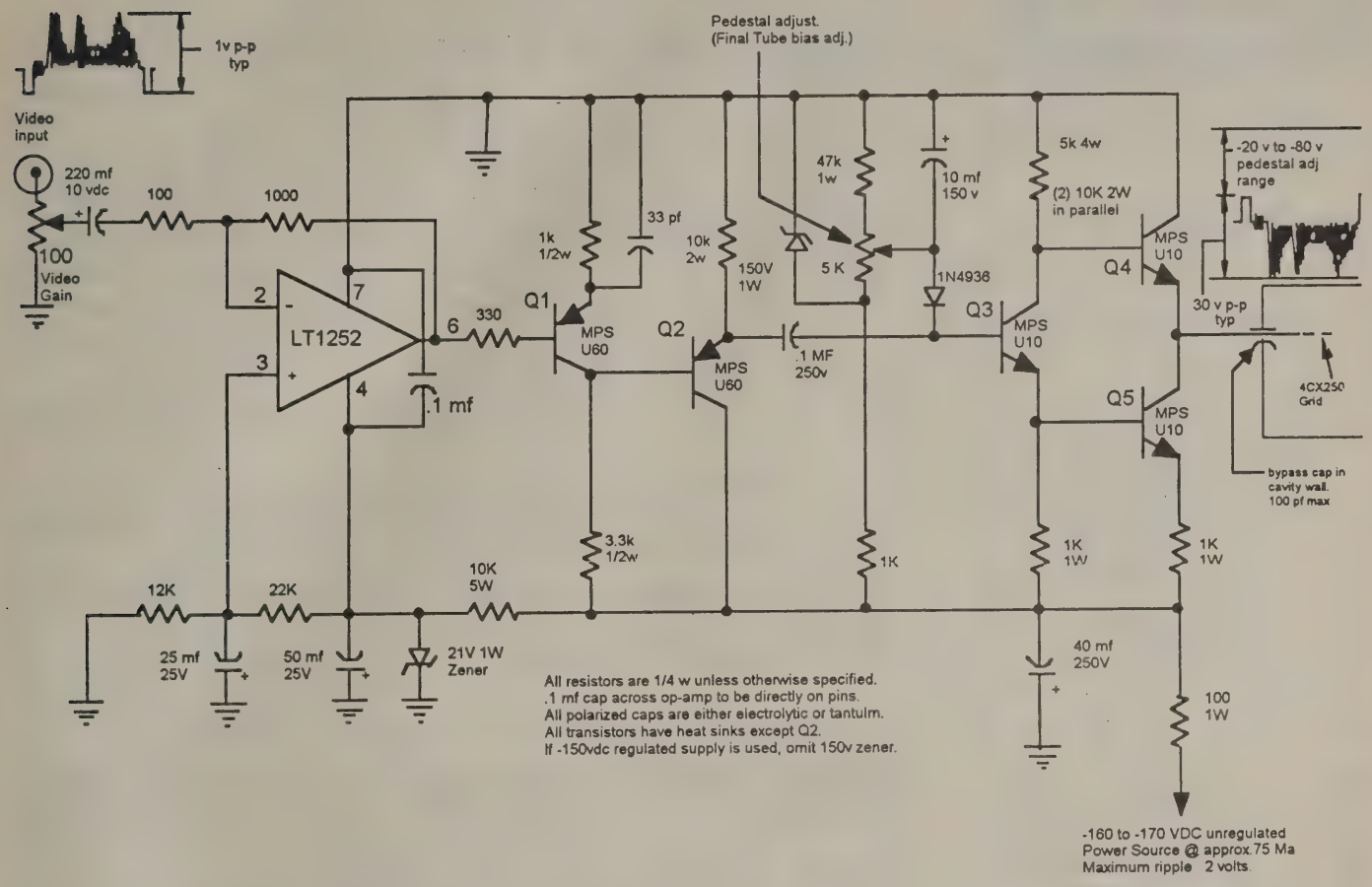
issues. Now that I mention improvements, I need to investigate the elimination of Q1 and Q2 and feed the op-amp output directly to Q3. There is actually just enough gain available to do this but didn't as yet because I don't know how much surplus gain is needed to accommodate other 4CX250 tubes.

The power supply is nothing special and does not have to be regulated. Almost anything that will source 160 to 170 volts at 75 Ma will do. Be sure that the overall ripple is less than about 1/2 volt p-p, or it might show up in the video. If the builder wants to go as far as using an electronically regulated power supply, the zener across the pedestal pot can be omitted.

General comments: All transistors except the PNP buffer stage must have heat sinks. All transistors must have a gain bandwidth product of at least 40 Mhz to function ideally and must have emitter/collector voltage ratings of at least 300 volts for reliability. I selected Motorola MPSU60 PNP and Motorola MPSU10 NPN units which turn out to be complimentary pair devices used primarily in the RGB output stages of color television receivers. Also, they are plastic units with a tab for easy heat sinking. CAUTION. The tab is electrically connected to the collector necessitating the use of insulating washers! The Amplifier will supply at least 50 volts P-P video from a 1/2 volt P-P video input which is more than required for the 4CX250 tube. Mine needed about 25 volts P-P with about a -75 volt DC bias. Overall bandwidth exceeded 6 Mhz, which is more than broadcast requirements! the Linear Technology #LT1252 video op-amp is available from DigiKey for about $4.00. Happy building!

Oh, by the way, after I built this, I found that my real trouble with the 4CX250 amplifier was bad finger stock on the grid cavity cover and an under-coupled output loop. Both are fixed now and the amplifier is working fine. It outputs about 50 watts average with 150 watts at the sync tip. I'm using 1500 volts @ about 150 Ma on the plate.

# HIGH LEVEL MODULATOR FOR ATV




# BALUN FOR ALFORD SLOT ANTENNA

Obtain a hobby shop brass tube with a snug fit over your unshielded coax at least a little more than 1/4 wave length long. Saw a very narrow slit on opposite sides at least 1/4 wave long.

Remove outer covering and shield at least 1/4 wave long.

Slip brass tube over unshielded coax down to shield.

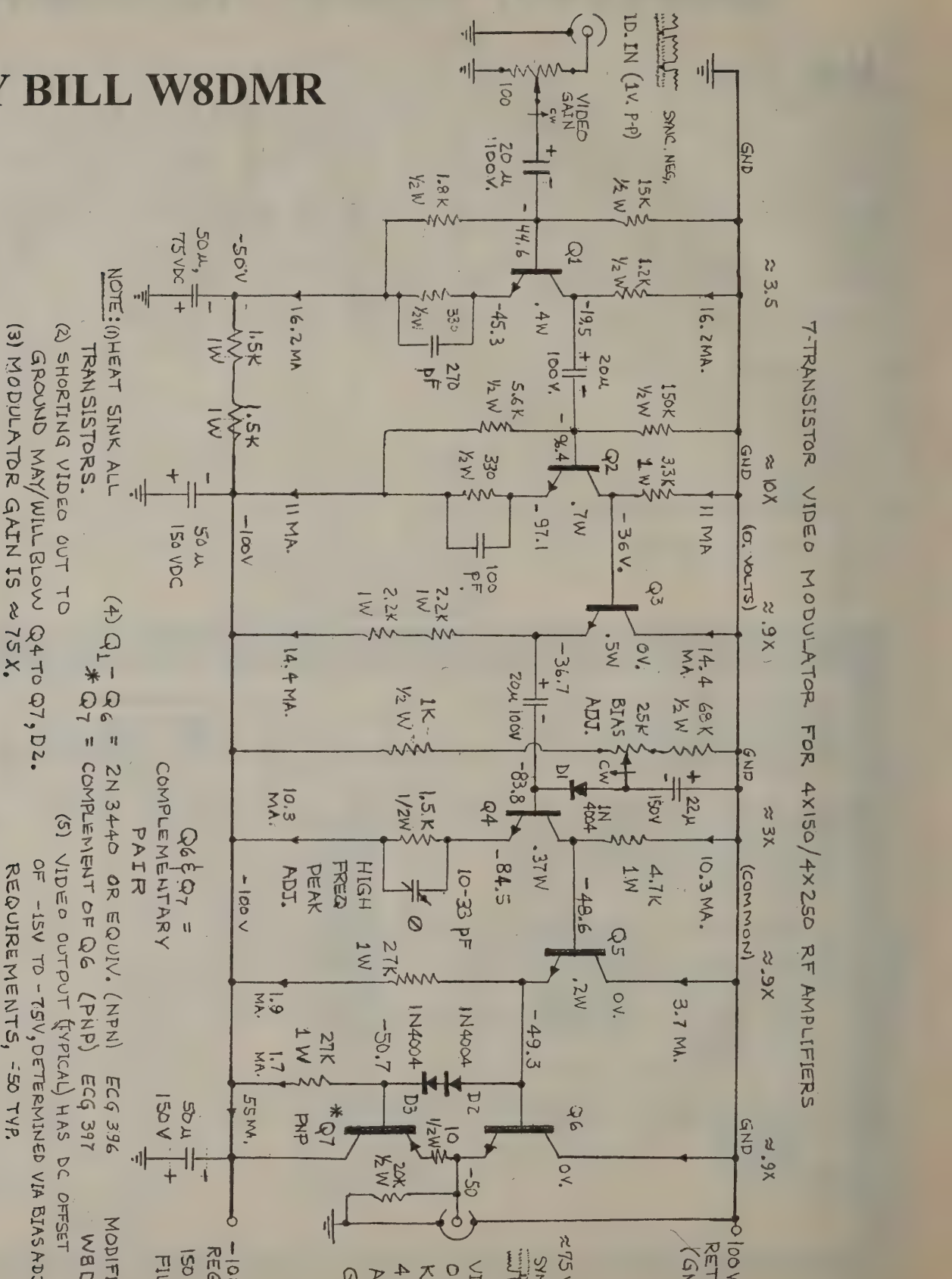
Place a small movable clamp around tube.

Mounted on the feedline, install inside the antenna so that the clamp is accessible through the antenna's slot. Move clamp to obtain match.

Roland, KB0GL

# HIGH LEVEL MODULATOR FOR ATV

## BY BILL W8DMR



# *MACCspeak*

As Chairman of MACC's (Mid-America Coordination Council, Inc.) Frequency Coordination Committee, let me assure you that it was not our agenda to walk into our meeting room with the idea of intentionally doing as much damage to ATV as possible.

The discussion, innocently enough, was prompted by concerns of AMSAT that many of the ATV operators are moving from 439.25 to 434 in an effort to get away from pre-existing, established coordinated operations and migrate into some "virgin territory" that would enhance their ATV operations. They seemed to care little that they intruded into the only 70 cm spectrum AMSAT can legally use; that from 435 to 438 Mhz. (And, no, I'm not an AMSAT user.)

As the discussion continued, other incompatibilities, with ATV being the common thread, became more evident:

1. 439.25 ATV incompatibility to/with long-established, coordinated repeater inputs/outputs from 440/442 to 445.
2. Aside from unfiltered operation on 421.25 extending out-of-band, it also has problems with/to linking and experimental modes.
3. 427.25/439.25 ATV operations' overlapping incompatibility with wide-band packet operations including those recommended by the ARRL Board in January 1988.
4. And mostly - ATV's inherently inefficient consumption of spectrum for just one user. Even if the operators were considerate enough to use VSB filtering (and most don't seem to be), just THREE ATV QSOs on 421, 426 and 439 would consume 60% of the entire 70cm band!

This is not MACC's idea of the responsible frequency management necessary to accommodate the maximum number of users in our limited amount of spectrum!

Our recommendation of ATV operations populating their ATV allocations above 902 Mhz does not seem to be unreasonable considering the potential users per given amount of spectrum:

902-928 Mhz - the two ATV channels consume 46% of the band!
1240-1300 Mhz - the five ATV channels consume 50% of the band!
2390-2450 Mhz - the five ATV channels consume 50% of the band!

*[Editor's note: According to the ARRL recent study of VHF-UHF frequency use, there are not enough hams on these bands to fill these bands anywhere even if you put them all in one location)*

We feel these disproportionately high percentages should be adequate for what little ATV activity we've seen.

Another contributing factor in the decision was that narrowband voice is BY FAR the most used mode in Amateur Radio (per ARRL survey). I'm sure this last argument will not be particularly placative to ATV publishers, users and 70 cm ATV manufacturers, etc., but the ATV displacement on 70 cm was just an unfortunate, albeit realistic, casualty of numbers...again, accommodating the most users in a given amount of limited spectrum.

It is not our intention to insert more voice modes into this band or to relegate ATV to secondary status. On the contrary, we are considering implementation of additional spectrum-efficient, compressed digital ATV channels, along with high-speed digital within these 70 cm allocations.

73, Whit Brown, WBCJX
Frequency Coordinating Committee Chairman, MACC

*[Editor's note: Of course it doesn't seem unreasonable to a bunch of FM mode users that they take over the entire band and displace 6,000+ users. Especially since they want to make all the decisions for all users without any input from other mode users! Cut the crap MACC!]*

Thanks for the quick response on the new 2 mtr repeater frequency allocations for the club (C.C.A.R.S.). Question: I wish to build and operate a 70cm ATV Transmitter for the Sinclair-Rawlins area to use for someday emergency use (monitor Sinclair refinery), as well as some Space Shuttle missions. I would like to operate at 30/40 watts, with the antenna (10 db) beam mounted at 30 ft aimed towards Rawlins from Sinclair. What do I need to do to use a "clear" frequency in the 70cm band?

Also for your records, I have been operating a bulletin station from my QTH in Sinclair on 147.530 at 40 watts. Any help would be appreciated.
73, Mike Reed, N7ZEF

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I am aware of the role that MACC plays in their feelings about ATV. I was disappointed to see that you are part of the organization. There is almost NO 70 cm activity in the area, or in Wyoming period. And if the band isn't used for anything, then it will be lost.

I was just being polite in asking where I could set a station up as to the frequency to use. Going to the 900 Mhz band means more expense to me to set up, less range as compared to 70 cm, and more expense to the other amateurs in the area who want to "see" due to the cost of having to buy a kit instead of using available surplus cable converters.

If you don't want me to use the 70 cm band, just say so. I just asked because I don't now what is in the area, and I don't want to interfere with anyone. And if I can't have a "slot" in the 70 cm band, I will just drop the request.
73, Mike, N7ZEF

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... Wyoming has refused to coordinate an ATV repeater in Rawlins/Sheridan, Wyoming because of MACC. Letter to me specifically states there are no other 440 stations on the air in the area! The local WY coordinator thanks MACC ... for guidance and helping this matter. What difference could an ATV repeater make in Wyoming where you could key down for 20 years and never have a QSO on 440!?

I would suggest that you tell the WY ATV group to hang on to all of the paperwork on the rejection, put their ATV repeater on the air, and if the coordinator says boo to them, sue the pants off of him and the MACC. If the coordinator says nothing this time, but then down the road makes trouble, then just make the claim that they were there first. After all, possession is 9/10's of the law.

After we set up the corporation, I'll have to get the B of D to condemn the ...chief of MACC in the strongest possible terms. The big ... of MACC and the work of T-MARC have got to go! A SPOC that is completely free of the ARRL is a good thing (we really do need a national organization of some kind). But not with those ... running it. When we do get an independent national organization; we will be able to force the ARRL to pay royalties. 73, Bill Wells, Indiana Repeater Council

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Your package of the 1995 Amateur Television Quarterly issues arrived today, and as per your request, we have placed you on our courtesy exchange list. You'll be receiving the next SERA Repeater Journal in mid to late February.

Your publication looks nice, and I'll pass them on to our editor AFTER I've taken the liberty to review their pages. The "TSQ" especially appears to be interesting reading.

By copy of this notice e-mail, and later with a follow up in person, I'll be sure Wayne knows of your interest in reprinting the KD4JGV ATV story. (Wayne, he could use both pictures and electronic form text if available.) Credit to the SERA Journal is not only "required," but is appreciated when someone actually does it!

Regarding your question, "Do you accept repeater membership from non-SERA states?", the answer is YES. Though we do not actively seek it, we do accept it and have a special place for them in the RJ (Repeater Journal) index. After the 8 SERA districts are listed, there's a place for non-SERA supporters. If my memory is anywhere close, the February 96 RJ will list an Alabama repeater, 4 Florida, 2 Indiana, and one from Texas. Thanks again for the materials. Welcome to the SERA!
David, KA4LVO Membership/Records Manager

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Another good issue. I was given verbal assurance by a member and officer of the Arkansas Frequency Coordination Council that 439.25/421.25 was fine for a Fayettville/Springdale/Bentonville area ATV repeater (and it would have been). Over a year later, the note came based on the MACC attack..."no more ATV repeaters"...yet last Saturday at a meeting at the Mena Ham Fest, they entertained frequency word on non-existent "high speed" (9600 ant fast) packet nodes right on my coordinated ATV frequency.

Now they are going to vote with a stacked deck. When it suits them, they cry for national decisions, then insist on local autonomy. Please, you and Tom and Maryann, etc., set up a wide band high speed digital and

video coordination council. You have as much authority as they do! I agree with everything you said about the little MACC attack.
73, Elmo Knock, K5YWL

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Great! I was most impressed with the recent article in SERA's journal. Beautiful repeater!

I have all the hardware and have been tinkering with my ATV repeater over the last couple of months. It is essentially a crossband repeater, with the output on 427.25, an AM input on 910.25 and FM on 1277.25. Aux. audio in is on 147.45 pl 88.5. I'm currently working on an old ceramic pa with a pair of 4cx250's, trying to broadband the output so I can have color vs. monochrome. Looking for about 250 watts pep output. The RX antennas are all vertical and the TX is horizontally polarized. The controller is a MCC VS-100/Elk ID'r. It is to be full time soon (I hope!) near Wendell, NC. I may eventually install an inband input on 23cm, but may opt for an inband pair on 13cm instead.

The RX's are PC Electronics, while the TX is ATV Electronics. I have/maintain several ham voice repeaters from 10 meters through 70cm, but video is a new animal to me altogether.

I'd sure like to see this list pick up stem, and am sure it will in time. I think that there is a lot of good info and ideas that could be passed around via this method.
73, de Dave Hockaday, WB4IUY

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## RFC 4-110 amp on ATV

I was asked by Len, WA9IZV, how do you know if an older RF Concepts 4-110 100 watt amp has the ATV mod in it?

If it was made after summer 1992, it probably has the added .1 disc cap in it for ATV. If you are not sure, and the color or sound seem rolled off, take a look inside. There should be a .1 disc cap with 1/4 inch long leads in parallel with a 30 pF mica cap C23.

Tom, W6ORG

# ATV Repeater Site Development Project Report

**Purpose:**

To develop an ATV repeater for the use of experimenting by hams. The repeater is to be open to all hams wishing to use it, with no restriction. Proposed frequencies are: ATV 439.25, 421.25, 1255, 1277 Mhz in and out; Control 222.000 Mhz; VOICE COORDINATION 144.340 Mhz. This allows the use of standard TV sets to receive and inexpensive transmitting equipment.

**Goal:**

1) To develop, install, test, donate an ATV repeater to NAARS

2) Increase the number of ATV hams in the community

3) Provide visual communications to the general public in emergencies and inclement weather conditions

4) Add a local radar system to cover the surrounding counties

**February 13, 1996**

At the North Arkansas Amateur Radio Society (NAARS) club meeting, a proposed resolution by Scott Ratchford, KC5JGV, to place an ATV repeater at or near the 147.000 voice repeater site on Boat Mountain was passed.

**February 15, 1996**

The first meeting between Scott Ratchford, KC5JGV, and Elmo Knoch, K5YWL, was held at K5YWL's QTH at 1:00 p.m. Discussed was the resolution to NAARS and where to begin. It was agreed that a test of the site would be held the following Saturday by KC5JGV using a mobile ATV system. Also discussed were the frequencies to be used to allow all hams and non-hams to participate in and view the ATV system. It was brought up that there may be some interference to the 439.25/421.25 Mhz signals, which can be received via a standard TV set, and the anticipated need for 1255/1277 Mhz signals.

**February 17, 1996**

KC5JGV and K5YWL arrived at the NAARS Boat Mountain site at 11:00 a.m. The setup and began to transmit on the 1.255 Ghz ATV frequency using a mobile ATV antenna and 7 watts. Tim Harness, N5YLF, in Welcome Home, 24.5 miles to the south, received the signal P5. (When reporting ATV received signals, P1 through P5 are used.) N5YLF then repeated the signal out on 439.25 Mhz which was received by Daryl Waggoner, N5HNX, 27 miles to the north. Although N5HNX is located just 6 miles from Boat Mountain, the signal received was traveling 50+. N5YLF received full color and sound, retransmitted the signal to N5HNX who received a P4 signal (sound and some color). N5YLF then generated and transmitted a signal direct to N5HNX and to Boat Mountain on 439.25 Mhz. Due to low line voltage, K5YWL was unable to transmit on the 429.25 Mhz frequency. One interesting occurrence was the locating of N5HNX's QTH via mirror flashes. KC5JGV operated the camera and hunted for the visual signal. K5YWL operated the transmission equipment, N5YLF re-transmitted the signal, and N5HNX was able to see his visual signals on TV. After two and a half hours of ATV fun, the tests were concluded with some encouraging results. It was agreed that an ATV repeater site on Boat Mountain could feasibly co-exist with the other NAARS systems. The goals was set to setup the 439.25/421.25 Mhz repeater as soon as possible and add the 1.255/1.277 Ghz frequencies as equipment became available. Additional testing was planned for the following Saturday.

**February 19, 1996**

Ordered the 421.25 Mhz ATV and the 439.25 Mhz ATV omni-directional double slot skeletal horizontal antennas from John Schaffer. W3FFT, 2596 Church Road, York, PA 17404, 717-764-4805. These are to arrive before Saturday via UPS Blue.

**February 20, 1996**

A QSO between KC5JGV and KtYWL was conducted on 144.340 Mhz at 5:45 p.m. Discussed was the use of the State Fire Tower on Boat Mountain for the repeater site was an option per N5HNX. Needed on the tower is a run of AC power to the platform. According to N5HNX, it would be no problem to do this, except that due to vandalism a secure box would be required to house the repeater equipment. Using the tower would have two advantages, however. They are the lack of long cable runs to the antennas, thus little or no loss of signal and the ease of serviceability. Secondly, it would put the repeater further away from the 147.000 site where there is a commercial 450 Mhz system in use. These advantages clearly outweigh the cost of securing the equipment with a secure box or security fence.

**February 22, 1996**

Ordered the 1255 Mhz ATV and the 1277 Mhz ATV omni-directional double slot skeletal horizontal antennas, model #23AS2 (9db Gain, 1.2:1 VSWR), from Ottmar Fiebel, W4WSR, @ Hi-Spec, POB 387, Jupiter, FL 33468, 407-746-5031. These are to arrive in three weeks. The equipment list and layout were worked on.



more>>>

# ATVQ CATALOG and SUBSCRIPTION FORM

I am not enclosing the usual color catalog in subscriber copies this issue.
So here is what is left in the vault of treasured publications:

**ATV Secrets VOL I.** a 100 page beginners book, non technical, answers all those FAQ's.
Less than 500 copies left. $8.95

**ATV Secrets Vol II.** a 300 page technical compendium with everything you need to know about every aspect of ATV and UHF operation. Over 90 technical projects, plus theory and more.
Less than 140 copies left $24.95
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**TSQ** A 24 page booklet, tongue in cheek humor on all forms of ham radio, richly illustrated, it tackles digital noise reduction, packet, etheral communications, ground mounted antennas, spread spectrum, rag chewing, computers, SSB and more. A side splitter if you really know ham radio.
Each copy individually printed! Don't order if you don't have a good sense of humor! $3.95

**IMPORTED BOOKS**:

**Slow Scan Explained** by Mike Wooding G6IQM. Simply the best book on SSTV around today.
Less than 15 copies left $16.95

**The ATV Compendium** from BATC. A great technical book applicable to UK and US systems
Less than 25 copies left $16.95

**An Introduction to Amateur Television** by Mike Wooding G6IQM. Another great technical book with projects useful to UK and US (PAL.NTSC) TV hams. Less than 25 copies left. $16.95

**POSTAGE: 1 book $3.50, 2-4 books $4.50, 5-up <u>UPS ONLY</u>**

**SUBSCRIPTIONS**:

**CQ-TV**, the quarterly ATV publication of the BATC 1996 rate $23.00 for all 1996 issues

**VHF Communications**, a great quarterly publication for VHF-UHF, SHF, Microwave and ATV
1996 rate $29 for all 1996 issues.

| RATE | ATVQ USA | CANADA | DX |
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| 1 yr | $16 | $22 | $29 |
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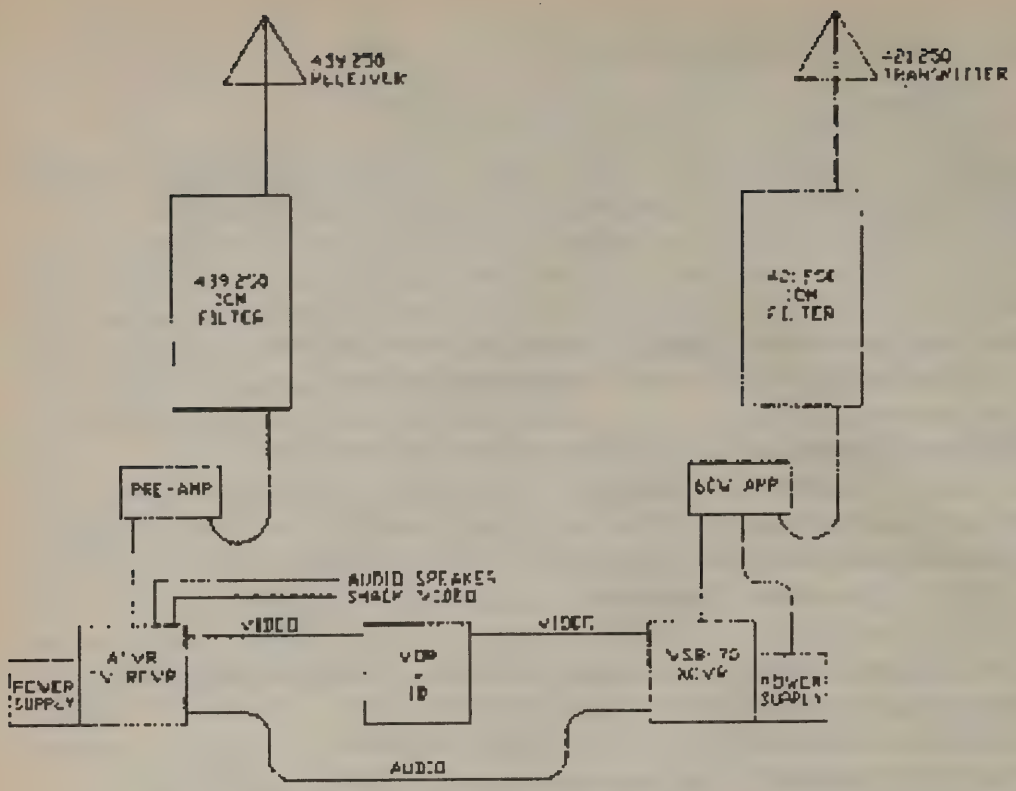



The system shown here is a "down and dirty" inband 70cm ATV repeater. This is the initial system that will be used for testing and final tuning of the antennas and filters. If all goes well, this repeater should be installed and running by March 9th. The goal is to add a controller with an input frequency of 222 Mhz. A complete listing of the control codes will be published. ATV repeaters can not be controlled using the 2m or lower bands. After adding the controller, which by the way has ten video inputs, the cross band and inband frequencies of 1255 and 1277 Mhz as well as the 910 Mhz receive will be added. The full blown system will be able to receive on 421.250, 439.250 910, 1255, and 1277 Mhz and transmit on 421.250, 439.250, 1255 and 1277 Mhz. This repeater system is intended to allow anyone to control and switch the input/ output frequencies.

***February 23, 1996***

A slight setback in our first site choice. It appears that the use of the fire tower on Boat Mountain may not be as readily available as we had thought. KC5JGV either misquoted N5HNX or misunderstood. In order to use this tower, we have to get permission from the State Forestry Service.





Letters will be sent to the proper personnel on Monday. We

are still planning to conduct more tests at the 147.00 repeater site on Saturday. The 421.250 and 439.250 Mhz antennas arrived via UPS.

***February 24, 1996***

Testing the new antennas did not go as planned. The club 147.000 repeater was moved back to its original location. K5YWL did, however, receive a P3 signal from Joe, N5QYC, in Harrison using a roof mount "clover leaf" horizontal antenna. Several hams came up to the Boat Mountain site to help. They were Daryl, N5HNX, Less, K5LG, Tom, Kc5GNS, Jack, KC5ESCC, ????, KC5LVV, ????, ??5???. Unfortunately, our concerns about the RF interference was well founded. The planned receive frequency of 439.250 Mhz was being eaten alive by the 147 repeater output.

***February 25, 1996***

Although yesterday was disappointing as looked as the project was over, we are still committed to the completion and installation of the ATV repeater. Instead of throwing it out the door, we put pencil to paper and came up with a viable solution. Instead of receiving on 439.250, the ATV repeater will transmit on 439.250 Mhz and will receive on 421.250. CAUTION: YOU MUST USE A FILTER WHEN TRANSMITTING ON 421.250 MHZ! The filter will keep your transmissions from entering government bands. Filters cost in the neighborhood of $250.00. So, we will be able to mount the antennas this coming weekend, and get started. To help keep the cost down, and get as many hams on the air as possible, we will add the 910 Mhz receive asap. Then as the equipment becomes available, we will add the 1.255 and 1.277 Ghz FM. We are looking for a ham that has or has access to a weather proof camera housing for a mast mount remote control camera. Plans are to add a remotely controlled tower mounted camera. (Can you imagine the responses we'd get with "live coverage" of the Field Day?) Here is a diagram of the ATV repeater as of now: (below left)

***February 29, 1996***

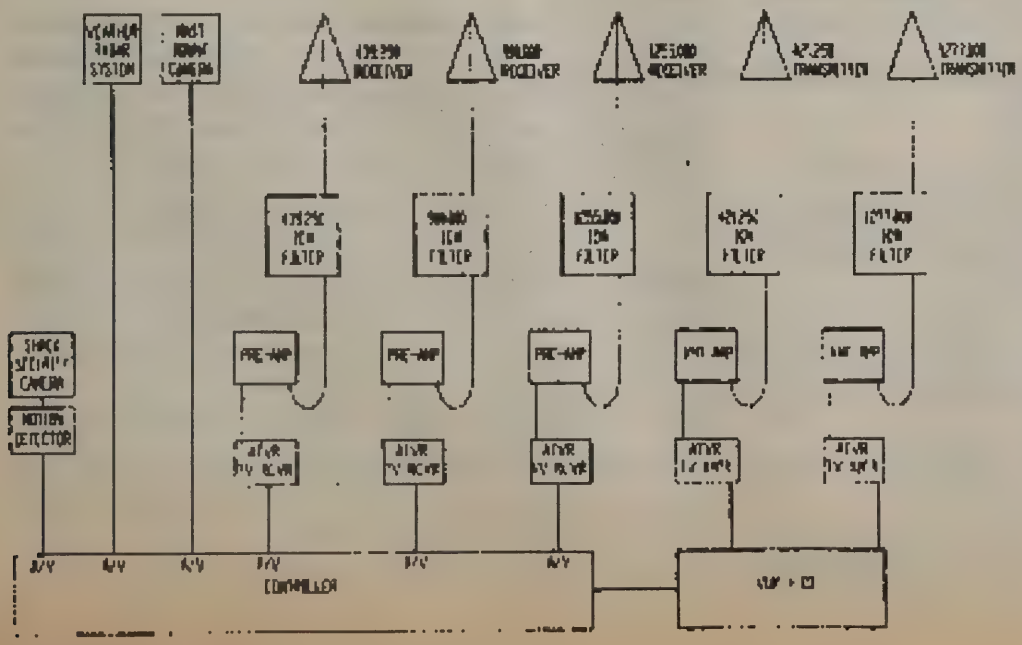
Leap Day! A fitting word, "leap," for the amount of information that KC5JGV received today through the InterNet. While surfing the net, he ran across the FEMA Home Page and looked at the information on a new service. This service, called "The FEMA Recovery Channel," could make use of our ATV repeater site, if ever required. Hence, if we are ever in need of funding to keep this project going, we may have a source. Tim Harness, N5YLF, ordered the first two cables today from WIREMAN.

***March 2, 1996***

Yahoo! After a few weeks of delays, mixed emotions, and a lot of hard work by several people, the first part of the ATV repeater is installed. At 2:15 p.m. the ATV repeater beacon officially began. Tom, KC5GNS, was gracious enough to come and climb the tower and attach the 439.250 antenna. After much couching and assurances, KC5GNS reached the height of 20', attached his safety belt and declared that**"this is high as it gets!"** And high enough it was. Immediately after the antenna was installed and we started transmitting, we received reports. Elmo, K5YWL, in all the excitement gave the whole world of onlookers a short dance lesson. The signal reports were as follows:

| | |
|---|---|
| KB5TZF | P3 |
| N5HNX | P5 on video P5 "best ever" |
| K5YWL | P5 "she was right" |
| KC5GNS | P3 "come back and get me off this tower" |
| KC5JGV | P5 on video |

The audio for the beacon is a microphone suspended in front of the 147 repeater speaker. We packed up and left for a long awaited steak dinner, courtesy of K5YWL.



***March 3, 1996***

K5YWL drove around with his mobile ATV equipment to see how the signals were being received. He reported that this signal was P5 on Hwy. 43 from hilltop to Hwy. 7. And equally solid on 206 to Airport Road. He even traveled south to Clinton. Additional reports were:

| | | |
|---|---|---|
| N5HNX | P5 | pointed North |
| N5QYC | P4 | |
| KJXI | "trying to get it" | |

*March 4, 1996*

Sent out an announcement to local newspapers. Pictures were included.

**A Message from KC5JGV**

This is a club project! All has, members and non-members alike, are welcome and encouraged to join in and help develop this system. Contact KC5JGV or K5YWL anytime on the 147.000 repeater or the ATV 2m calling frequency of 144.340 simplex. Most of the work is planned to be done each Saturday on Boat Mountain and you are welcome to join us. If you have any suggestions or comments, please let us now!

I want to thank all of the following hams for their help and support of this project to date. Without their help and hard work, this project would have never gotten off the ground.

| | | | |
|---|---|---|---|
| K5YWL | Elmo Knoch | Osage, AR | Technical info |
| N5YLF | Tim Harness | Welcome Home, AR | Technical info |
| N5HNX | Daryl Waggoner | Everton, AR | Signal reporting |
| N5QYC | Joe Puett | Harrison, AR | Signal reporting |
| KC5GNS | Tom | Harrison, AR | Tower Work |

**Downloaded from the FEMA Home Page on the InterNet**

**The Fema Recovery Channel**

**Why a Recovery Channel?**

Floods, fires, hurricanes, explosions, civil unrest, tornadoes, terrorism and earthquakes: natural and man-made disaster can happen anywhere. They can affect any town or city in America.

The Federal Emergency Management Agency (FEMA), in association with state and local governments, has created The Recovery Channel in response to an ever-growing need for disaster information.

How does it work?

The Recovery Channel delivers a video feed via satellite directly to disaster areas. It is designed to disseminate vital emergency information by key local, state, and federal officials during disasters.

What does it provide?

Official news reports are beamed to viewers from professionals on the front lines of emergencies across the United States.

Daily news conferences highlighting response efforts.

Live remote telecasts covering in-studio and on-site interviews of FEMA, state and local disaster managers with immediate updates on the latest recovery issues.

Live field reports on damage assessments and the recovery effort underway.

Live interactive call-in programs allow viewers to ask important questions about essential issues.

Invaluable disaster tips for protecting family members, their homes and their possessions.

Updates on the locations of vital relief supply distribution points.

Foreign language programming to serve the ethnic mix of any community and reach viewers who may lack other traditional forms and sources of information.

**Who needs to see it?**

The Recovery Channel is more than a news report or a news briefing. It is a lifeline to communities in crisis. The Recovery Channel provides vital information to all groups of people affected by disasters.

People devastated and injured who need immediate assistance.

People with damage to their homes or property.

Businesses impacted by the disaster.

Government agencies and officials needing the latest information.

Television news media around the country.

**What can you do?**

Cable System Operators: For more information on how to become a Recovery Channel affiliate, please contact FEMA's Office of Emergency Information and Public Affairs. Send your e-mail to eipa@fema.gov or call 202-646-4600.

Broadcast Television Stations: For more information on how to receive immediate notification of disaster news briefings via satellite, please contact FEMA's Office of Emergency Information and Public Affairs. Send your e-mail to eipa@fema.gov or call 202-646-4600.

State and Local Emergency Managers: For more information on how your important emergency and disaster-related information can be carried on the Recovery Channel, please contact FEMA's Office of Emergency Information and Public Affairs. Send your e-mail to eipa@fema.gov or call 202-646-4600.

Television Viewers: Contact your local cable television company and broadcast television affiliates and make sure they are aware of FEMA's Recovery Channel emergency television programming.

Copy of News Release Submitted on March 4, 1996

# Special Announcement From The North Arkansas Amateur Radio Society

The North Arkansas Amateur Radio Society is pleased to announce the first ATV repeater with color and sound dedicated to cover the Marshall, Harrison, Jasper area. This is not a commercial station. It is owned and operated by amateur radio enthusiasts operating on an assigned ATV frequency. The ATV repeater went on air at 2:15 p.m., Saturday, March 2, 1996. Currently operating on an output frequency of 439.250 Mhz as a beacon for test purposes.

The purpose of the ATV repeater is to repeat various signals from different locations around the area for amateur radio and general public reception and use. One of the main purposes is to provide live local weather reporting during inclement weather conditions. A local weather radar system is planned to be placed on the air as funds become available. Other uses for the repeater can include live local coverage of public events, parades, general interest events, etc.

The repeater is located on Boat Mountain just west of Western Grove. It can be received on any cable ready TV or VCR tuned to cable channel 60 and a UHF antenna pointed at Boat Mountain. Currently the signal is an identification screen for test purposes. If you can receive the signal, we would appreciate a report of how well or how poorly it comes in. Please send a post card to: KC5JGV, POB 1246, Marshall, AR 72650 or call 501-448-6020 and leave a message. Please include your name, location and description of the picture.

If you are interested in ATV or want to know more about Amateur Radio, please call or come in to our next meeting on Wednesday, March 13th, at Fire Station #2 on Industrial Park Road at 7:00 p.m.



# *RF-IC's*

Motorola has RFIC chipsets (LNA/mixers, upmixers, exciters, Pas, switches, modulators) for 900 Mhz, 1.8 Ghz and 2.4 Ghz, and they're advertising freebie sample kits of same. The ad doesn't say which parts are included in the kits, but this looks like a real deal for you intrepid RF experimenters out there...the part nos. for the kits of interest are:

900 Mhz - CSPDMRFIC9PAK/D
2.4 Ghz - CSPDMRFIC24PAK/D

The number to call is 1-800-441-2447. Saw this in "Microwave Product Digest," January 1996.

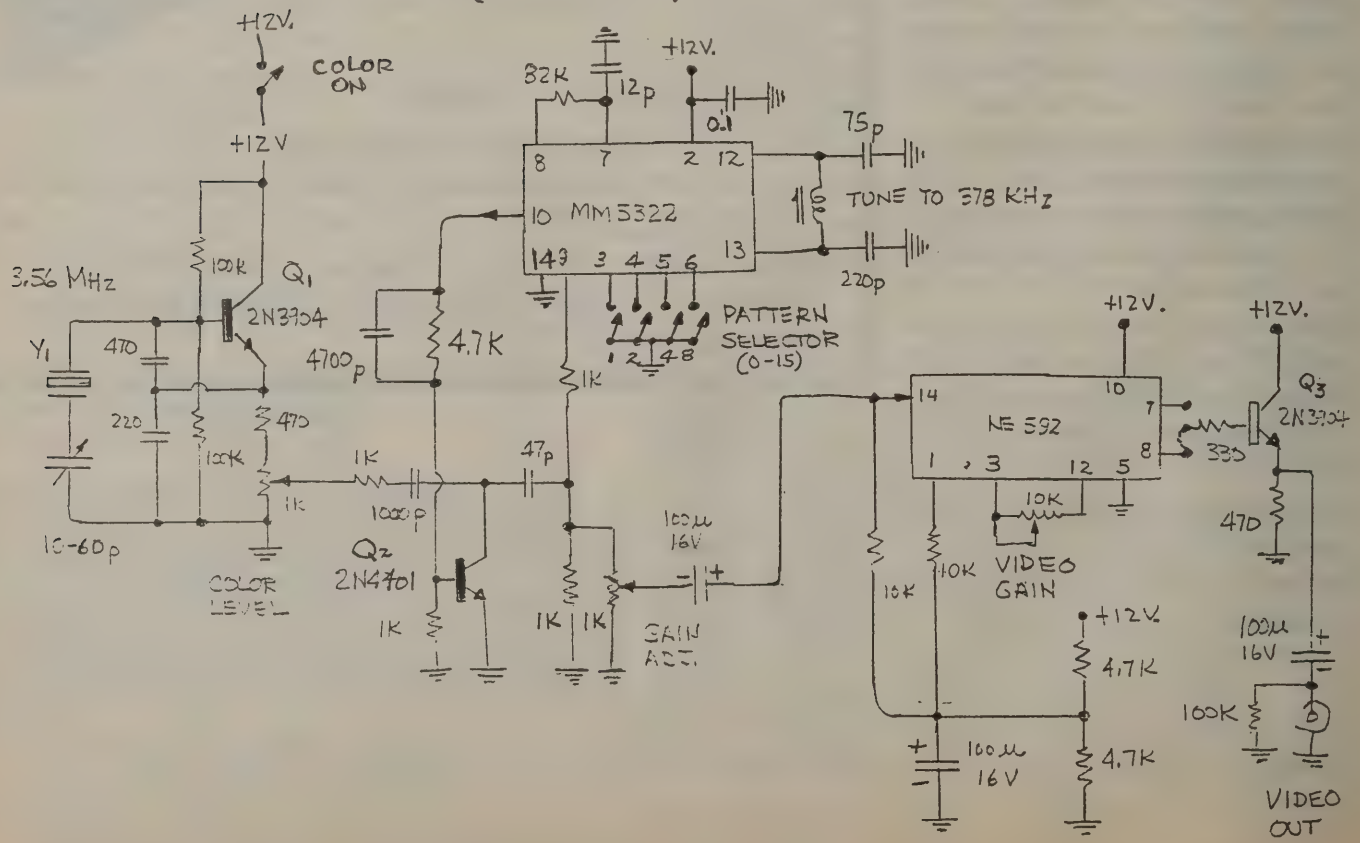
Barry, VE3JF/VA3TCP

# COLOR BAR GENERATOR

## by Bill W8DMR

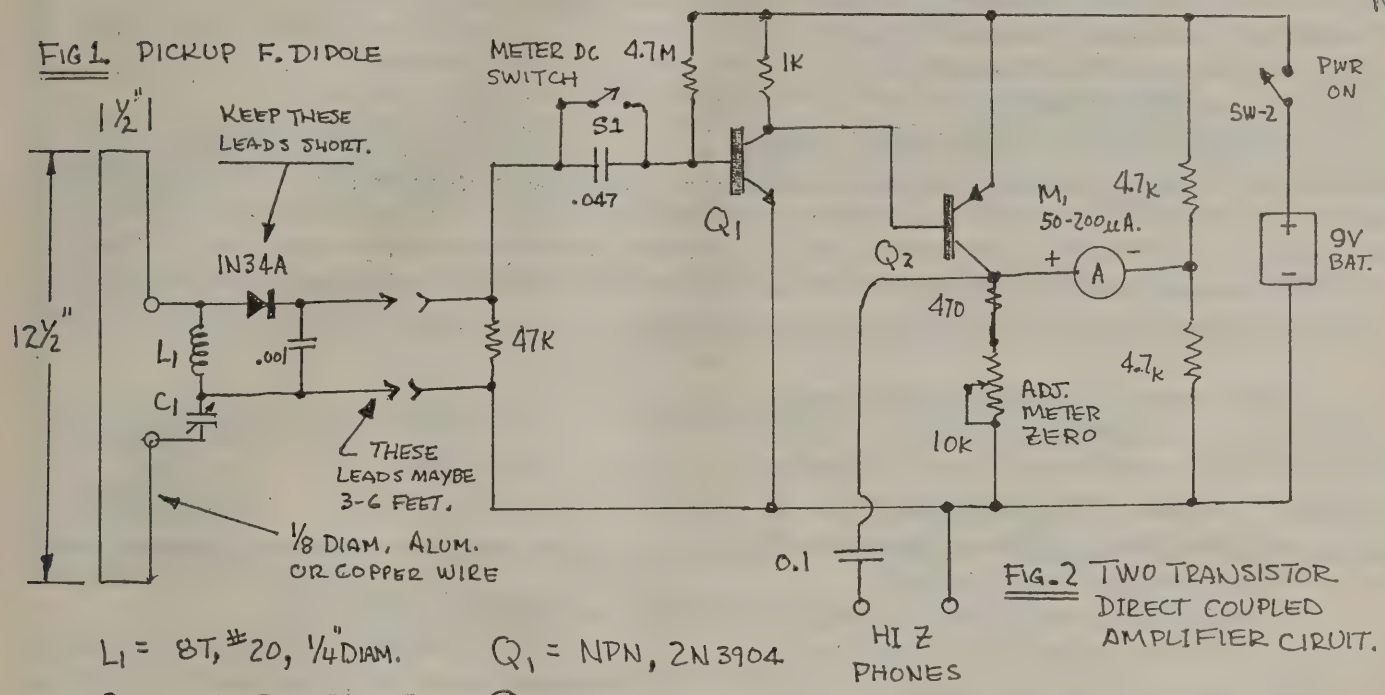
7 DEC 87
W8DMR

FSTV COLOR BAR GENERATOR
(16 PATTERNS)



# FOX HUNT RECEIVER
## by Bill W8DMR

W8DMR




$L_1$ = 8T, #20, ¼" DIAM. $Q_1$ = NPN, 2N3904.

$C_1$ = 3-12 PFD. TRIM. $Q_2$ = PNP, 2N3906

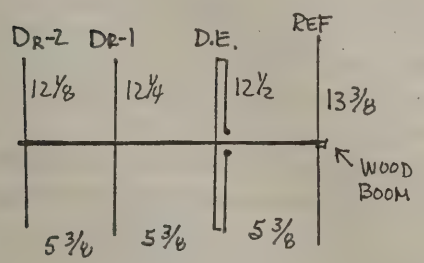



FIG. 3 4 EL. YAGI

NOTES: (1) LISTEN FOR SIGNAL WITH SW-1 OPEN.

(2) WHEN CLOSE TO HIDDEN TRANSMITTER, CLOSE S-1 AND WATCH METER FOR MAX. READING. W8DMR

HIDDEN TRANSMITTER FINDER INFO.

# ANTENNA STACKING DISTANCE

Bill, W8DMR

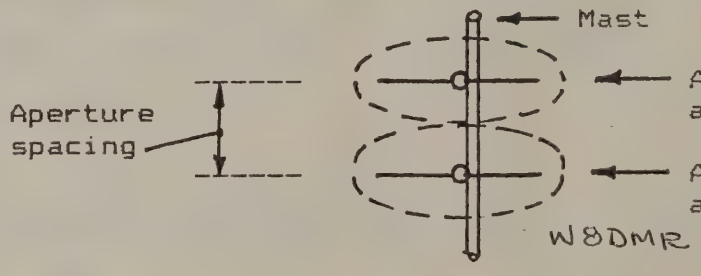
What determines just how far apart two antennas should be spaced or stacked? Several physical and electrical properties need to be taken into consideration. The length of available rotatable mast above the top of the tower, the number of ham bands to be utilized, the type of antennas selected, the gain of the antennas chosen, and the wavelength of the operating frequencies.

Another consideration when stacking antennas is which axis of the antenna array should exhibit the narrowest or widest angular acceptance, vertical or horizontal? Also, the wind loading of the completed multi-band multi-antenna array must not be ignored for the survival of the rotating mast and/or the tower and/or the antennas!

Are the antennas to also accommodate satellite operation? If so, what considerations must be made for the elevation axis? Also, suppose that both vertical or horizontal signal polarization must be accommodated for other than satellite operation? Three rotors, one for azimuth, one for elevation, one for polarization?

When stacking two equal antennas, impedance matching or a power divider is required, else the three dB gain improvement sought will not be obtained.

Antennas have a physical aperture and an effective electrical aperture, sometimes referred to as capture area. Yagi antennas have an effective aperture considerably larger than its physical size. A parabolic dish has an effective aperture somewhat less than its physical aperture. In order to obtain the possible 3 dB gain from stacking two identical antennas, the effective electrical apertures must not overlap. Space or stack the two antenna arrays so the effective apertures are tangential or just touching. This allows maximum gain consistent with minimum stacking distance. If the electrical apertures overlap, the total power gain obtained will be less than 3 dB.




The effective aperture, (Ae) of an antenna is a function of its power gain, (Gi) its operating wavelength, (WL) as follows:

$$Ae = \frac{Gi \times (WL)^2}{4 \times PI}$$

**Antenna Stacking Formulas**

Physical frontal antenna area is not the same as effective electrical area! To obtain stacking distance, first calculate the effective electrical area of the antennas to be stacked. Stack the antennas so that the adjacent sides of the apertures do not overlap. A formula for the effective aperture, (Ae) is:

$$Ae = \frac{G1 \times (WL)^2}{4 \times PI}$$

Where: Gi is the power gain of the antennas in reference to an isotropic radiator

WL is the wavelength for the frequency of operation

If the antenna power gain is referenced to a dipole, use the formula below:

$$Ae = \frac{1.64 \times Gd \times (WL)^2}{4 \times PI}$$

The formulas are for antenna gains that are not in decibels. A dipole has 1.64 times the gain an isotropic radiator, which is also 2.14 dB. The effective aperture, Ae will be in the same units of measure selected for wavelength.

# K3NXF ATV REPEATER ON-LINE

**John Maetta, N6VMO**

California's Central Coast gets an ATV repeater. On Saturday, November 18, 1995, the Santa Ynez Valley ARES group permanently installed the K3NXF ATV and WA6BRW 2 meter repeaters. SYV ARES received permission from Santa Barbara County in late spring to install a 2 meter repeater, 2 meter packet node (FIG), ATV repeater, equipment cabinet and a 40' tower at the ranger station on Figuroa Mountain in Santa Barbara County. The ATV repeater specs are: 434.00 Mhz input and 1253.25 Mhz @ 18W output, using P.C. Electronics ATV gear feeding Comet verticals. ATVers in the Lompoc, Santa Maria and Santa Ynez valleys could now exchange ATV video.

Ron K3NXF, Dave WA6BRW, Randy KD6GIK, Buzz KE6BQC, Don KM6DJ, along with Lompoc ARES members Roy N6BUV an Paul KD6AMT met at the ranger station at the 4100' level of Figuoroa Mountain. Antenna brackets were mounted to the tower and coax was routed to the equipment cabinet. A test of the packet node and ATV repeater was conducted with the help of John N6VMO, located 32 miles to the west, in Vandenberg Village. Initially received K3NXF ID pictures were rolling P2 B/W, but with a tweak of the amplifier's pedestal and video gain, John was able to get a stable P3 with flashes of color.

Later that afternoon P3-P4 color pictures from K3NXF's ID were received in Lompoc by N6BUV and KD6AMT along with P3 B/W by Ray W9JKV in Vandenberg Village. The 1900' Red Rock mountains, between the repeater site on Figuroa Mountain and Lompoc/Vandenberg Village account for the poor picture quality. The ATV groups in Lompoc and Santa Maria, 24 strong, still had plenty to get excited about.

Saturday, January 6, Larry KB6VAA and N6VMO exchanged the first pictures between the Lompoc and Santa Maria valleys. Signal reports from both stations were P3 B/W with poor audio. Great circle distance from KB6VAA to N6VMO is 13 miles, but with the 900' Purisma Hills separating the two valleys, ATV simplex operation is impossible. Round trip distance for the pictures via the repeater is 58 miles. I guess we like doing it the hard way. Later that evening, Bill KE6BAY in Santa Maria could be seen via the repeater by N6VMO. A two way exchange between the two stations could not be completed. Bill did not have a 1.2 Ghz receive equipment.

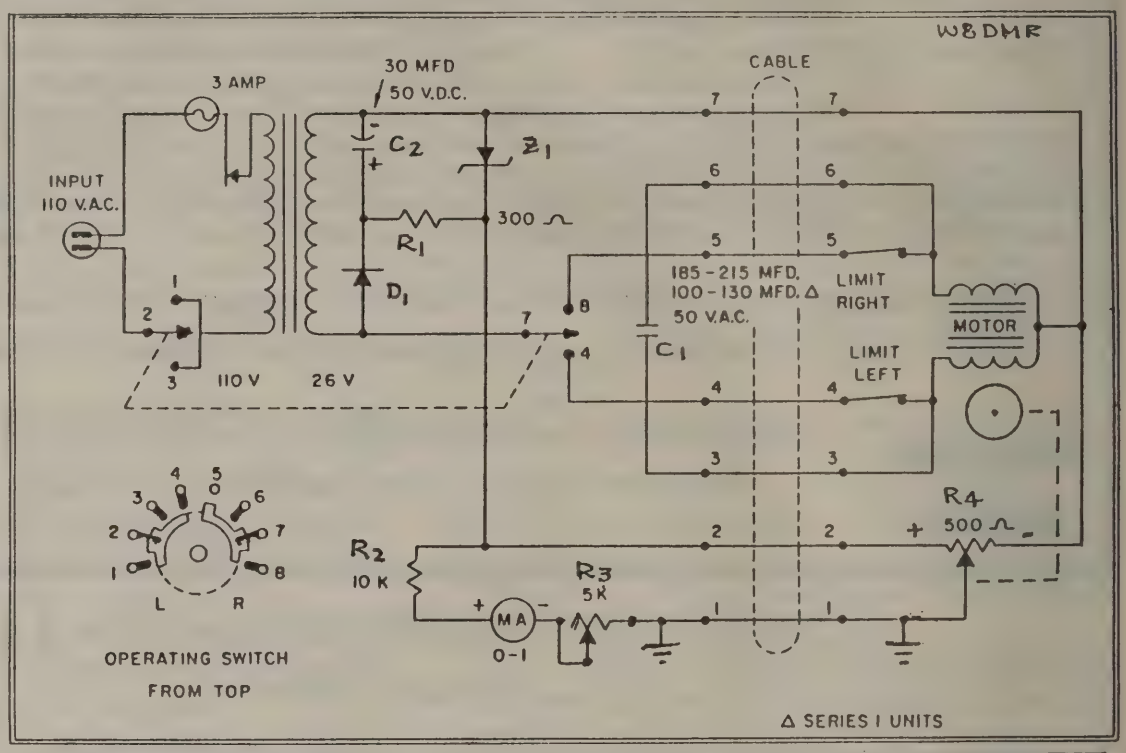
Special thanks to the Santa Ynez Valley ARES group for their efforts and fine work.

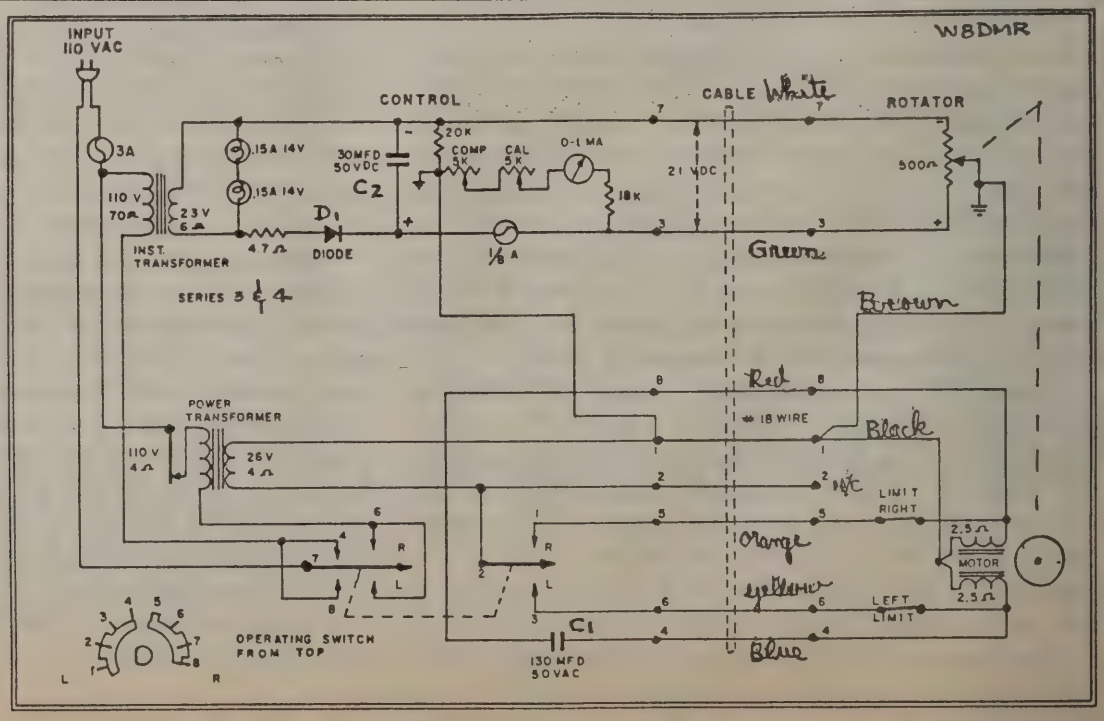
# ANTENNA ROTOR SCHEMATICS
## by Bill W8DMR

Sooner or later, most antenna rotators systems need some type of maintenance and/or repair. Rotors purchased at hamfests or discarded units are seldom found with schematics. Two schematics, covering four series of production runs, are included herein. They are for the popular CDR units.

Studying the schematics before attempting to repair the rotor is the best way to begin. Depending on the amount of usage, the motor phase shift capacitor located in the control box usually requires replacement periodically. The capacitor is a non-polarized AC electrolytic component in the range of 125 to 225 MFD. A good practice is to keep a spare capacitor available for substitution testing. Not all electronic part stores stock the capacitors. If you would like more rotor schematics to appear, such as the Alliance U110/110, let your editor know so they may be included.

Schematic Diagram SERIES 1 and 2




Schematic Diagram SERIES 3 AND 4

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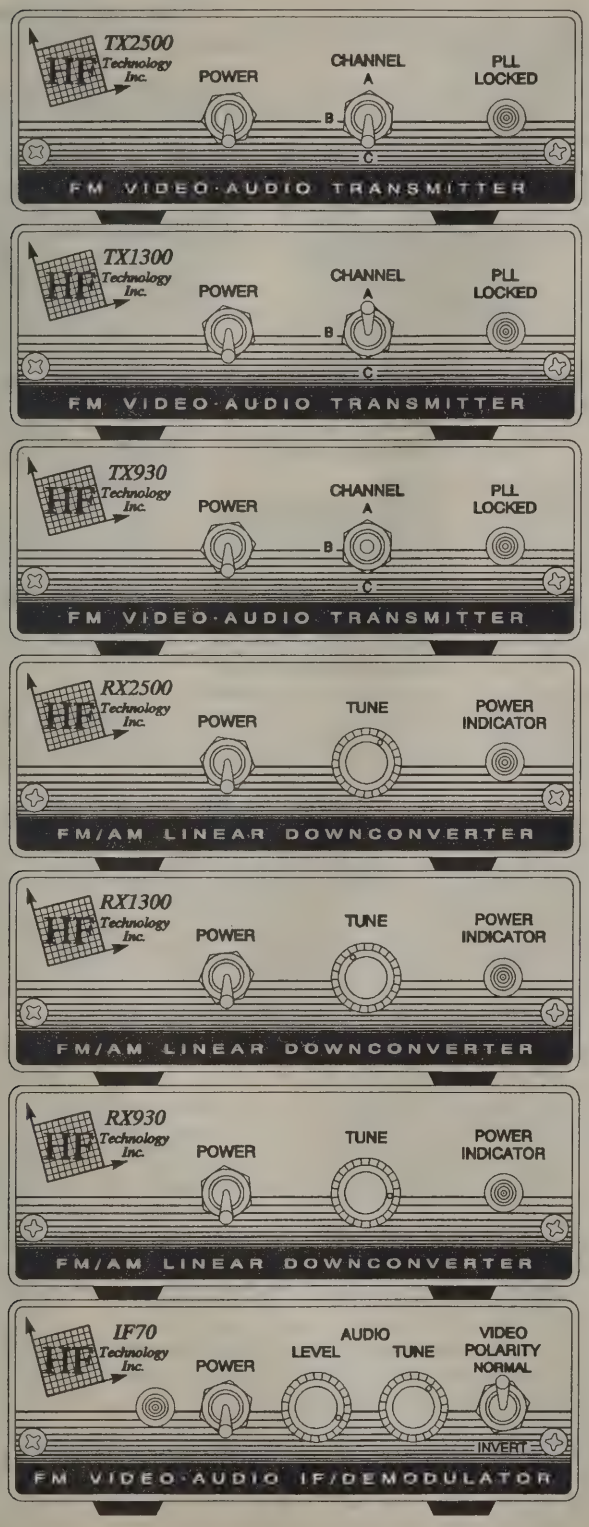
457 SANTA FE TRAIL
CARY, ILLINOIS 60013-1981
Phone: (708) 639-4336




## *TX2500, TX1300, and TX930*

- Conservatively rated modular 1 Watt RF output stage.
  (0.5 Watt GaAs power amplifier on the TX2500)
- Fully synthesized channels covering the entire amateur band:
  2390 to 2450MHz for the TX2500
  1240 to 1300MHz for the TX1300
  902 to 928MHz for the TX930
- Ultra linear, low phase noise VCO for unsurpassed video quality never before seen in an amateur television transmitter.
- Video frequency response from 10Hz to over 4MHz .
- Built-in 5.8MHz high fidelity audio subcarrier generator.
  (internally adjustable from 4.5 to 6.5MHz)
- Audio Frequency Response from 10Hz to 15kHz

## *RX2500, RX1300, and RX930*

- Low noise unconditionally stable MMIC front-end amplifier for sensitivity, stability and reliability.
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- 6-pole interdigital bandpass filter for great image rejection.
- Optimized IF output filter provides spectacular rejection of local oscillator leakage and low dispersive effects.
- AM amateur television reception as well as FM amateur television reception when used with the IF70 IF/Demodulator.
- Low phase noise local oscillator resulting in unrivaled on channel sensitivity and adjacent channel interference rejection.
- Greater than 80dB linear dynamic range with virtually no spurious outputs. (The signals at the IF output are really received and not generated within the downconverter.)

## *IF70*

- The only FM video-audio IF / Demodulator specifically designed for FM amateur television use.
- Phase-locked loop video and audio demodulators "lock" on transmitters with frequency drift and maintain the utmost picture clarity.
- Tune in audio subcarriers from 4.5 to 6.5MHz (4.5MHz ceramic filters optional) with "Hi Fi" broadband response.
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- Optimal differential gain and phase response through the use of linear phase filtering in both the IF and base band circuitry.

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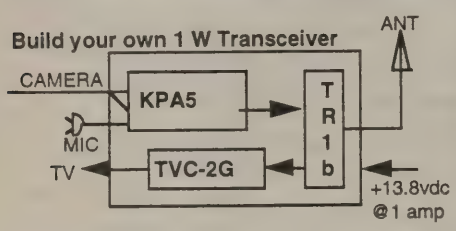
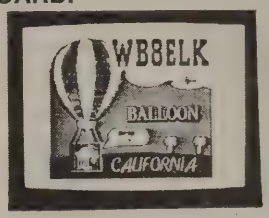
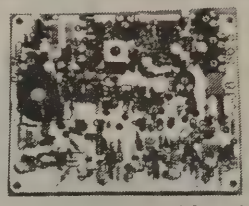
# THE "KREEPIE PEEPIE" ATV TRANSMITTER

**THIS IS THE 420 - 450 MHz BAND ATV TRANSMITTER BOARD YOU HAVE READ ABOUT THAT HAS SURVIVED MANY BALLOON FLIGHTS TO OVER *100,000 FEET* AND BACK. ALSO USED FOR ROCKETS AND R/C MODELS WHERE AN ALL IN ONE BOARD WITH SOUND IS DESIRED OR FOR DEDICATED LINKS AND REPEATERS. JUST THE THING FOR THE BUILDER WHO WANTS TO PACKAGE AND MAKE HIS OWN PORTABLE OR HOME TRANSCEIVER WITH A WIRED AND TESTED BOARD.**



3.25 x 4", Video and Sound

**KPA5-F board only $169**

## KPA5-F 70CM ATV XMTR BOARD FEATURES:

- 1.5 Watts P.E.P. adjustable to 100mW. Run barefoot for portable, but if needed for greatert DX, the output properly matches the RFC Mini-Amp 15 watt, D26N-ATV 50 Watt linear amp for full output or D100TVN to over 70 Watts with its adjustable sync stretcher. Same board as used in TX70-1b.
- FULL COLOR AND SOUND on a small 3.25 x 4" board
- Wired and tested board runs on external 13.8 Vdc @ 300 mA. supply or 12 V battery. Weighs only 3 oz.
- Accepts composite video from cameras, camcorders, VCRs, computers, etc. 2 audio inputs, one for low Z dynamic mic, & one line level from most cameras & VCRs. Transmit monitor output enables seeing your own true RF detected video.

## ACCESSORIES:

**L.M.B. CAB247** 7.3x4.7x2" roomy aluminum box.....**$22**
**CAB234** 4.6x3.6x2" aluminum box, smaller tighter fit.....**$14**
**100 Ohm carbon panel pot** for video gain control.....**$5**
**TR-1b** RF T/R relay module, mounts on chassis N conn.....**$29**
**UG58** N fem.chassis jack..**$2.** **UG21** male 9913 plug..**$5**
**TVC-4G..$89 or TVC-2G..$49** Downconverter (page 5)
**RG174** 50 Ohm 1/10 inch dia. coax cable, 6ft.....**$3**
**RF CONCEPTS Mini-Amp 440-N** 1.5 in /12-18 out .....**$129**
**MIRAGE D26N-ATV** 1.5 in / 50 out all mode amp.....**$249**
**MIRAGE D100TVN** 1.5 in/70 out all mode amp.....**$369**

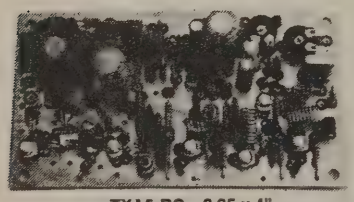
## KPA5 APPLICATION:

*PORTABLE CORDLESS TV CAMERA.* Think of it as a video HT. Place the KPA5 in one of the L.M.B. Diecast aluminum boxes, Diamond RH77CA half wave on top or at the end of 50Ω coax attached to a headset. Plug into a 12 to 13.8V source such as a 12 Vdc battery pack. Depending on terrain & receiving antenna DX is typically over 1 mile. Then at home with KLM 440-16X antennas at both ends DX is >22 miles snow-free line-of-sight.

**Price only $169** supplied with one crystal on 426.25, 434.0, 427.25 or 439.25. 2nd xtal add $20. Has 2 relay switched crystal sockets. Specify frequency(s) when ordering, check with local ATVers, ARRL Repeater Directory or call us. Sold only to code free Technician class or higher licensed radio amateurs.

**DIAMOND RH77CA** 2m/70cm omni antenna, BNC, 15"...**$30**
**DIAMOND RH951** 2m/70/23cm omni antenna, BNC, 15".....**$52**
**DIAMOND NR-770H** 2m/70cm mobile ant. , UHF, 3/5.5 dBd.....**$59**
**DIAMOND MX-72N** 2m/70cm antenna duplexer.....**$59**
**AEA 450 ISOPOLE** omni 4 dBd vert. gain antenna, N.....**$89**
**KLM 440-6X** 8.9 dBd ant., 28" boom, >50 deg. BW.....**$65**
**KLM 440-10X** 11.2 dBd, antenna, 64" boom.....**$82**
**KLM 440-16X** 14.2 dBd antenna, 10.5 ft boom.....**$142**
**RUTLAND FO-22-ATV** 15.8 dBd, antenna 14 ft boom.....**$139**
**1000 pF Feed-thru Cap** for R/C or repeater builders.....**$4**

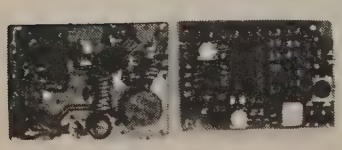
## SMALL TXA5-RC 1 WATT ATV TRANSMITTER.....$129



TXA5-RC 2.25 x 4"
Video only

Designed primarily for Radio Control models, Rockets, Balloons, etc. with it's small 2.25 x 4 inch size and 2 oz. weight. Adjustable power output from 1.5 p.e.p. to 100 mW. Draws 350 MA @ 13.8 Vdc at 1 Watt, 200 ma at 100 mW. Has adjustable sync stretcher and provisions for sound from the FMA5-F board (pg 2) in case your application needs higher power sometimes or subcarrier sound. Comes wired and tested ready for you to mount in a shielded enclosure, connect up coax from antenna and camera and wires to power source. Plan on shielding your R/C receiver and adding the simple antenna low pass filter supplied with the application note. Receive with one of our 70 cm downconverters listed on page 5 and a TV set. Specify frequency, 426.25 MHz suggested for R/C, other standard ATV freq. avail.

**TXA5-70b 80 mW** board can also be used for R/C applications where 2 frequency capability is desired - 2nd xtal $20. Same size as TXA5-RC but 80 mw output for .25 to 5 mile DX, or add 10 Watt PA5 amp for 3 to over 100 mile line of sight DX. See page 2....**$89**



ATVM-70 Transmitter 80mw, 1.0x1.3" MSC-2 Sound

**MICROTEK ATVM-70 MINI ATV transmitter board.....$209**

Only 1.0 x 1.3 inch, wired and tested board. See article in July 91 73 Magazine page 9. Nominal output 80 mw. Capable of driving the PA5 for higher power. Requires 7.0 to 10.0 Vdc maximum at <100 ma. Only 434.0 MHz is available with the SAW oscillator. Also Great for R/C models, robots, demos or short links. Snow free line of sight DX1/4 mile dipole to dipole or up to 5 miles with KLM 440-16X beam antennas.

**MSC-2** companion 4.5 MHz sound subcarrier board, same board size as ATVM-70.....**$59**

Remember when comparing prices, ours include UPS surface shipping in cont. USA. 5/96

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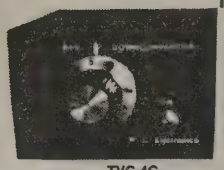
# 420-450 MHz ATV DOWNCONVERTERS

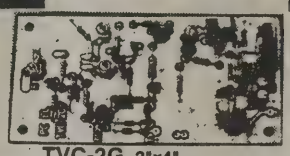
**GET STARTED WITH ONE OF THESE TO *SEE* THE ACTION!**

**Space Shuttle video** off the air from an ATV Repeater.



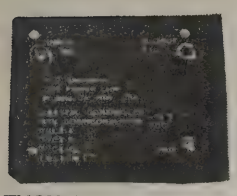
TVC-4G

**TVC-4G PACKAGED DOWNCONVERTER** with AC supply.....**$89** Contains the sensitive TVC-2G board in a black die cast 4.7x3.7x2.1 inch aluminum box ready to go with 120 Vdc 60 Hz to 12Vdc 100 ma. wall plug power supply. N connector antenna input and F output to TV. Companion downconverter to our TX70-1b transmitter and other TX boards. TVC-4G is handy for ATV portable, mobile, demos, or getting a friend on. Also used in community pay TV systems outside USA.

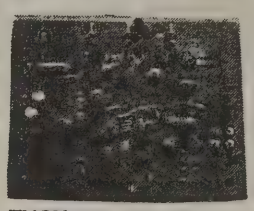


TVC-2G 2"x4"

**TVC-2G GaAsFET TUNEABLE DOWNCONVERTER BOARD.....$49** Wired and tested module connects between 70cm antenna and TV set tuned to channel 2, 3, or 4 (special order 45.75 MHz IF or LVSB). Varicap tunes whole 420-450 MHz 70CM Amateur band. Sensitive 1 dB NF dual gate GaAsfet used in both the preamp and mixer stages. 25 dB gain. Requires +11 to 18 Vdc @25 mA, shielded enclosure, knob, 10K panel pot, switch, .5A fuse and connectors.



TVCX-4



TVCX-70 3"x3.8"

**TVCX-70 XTAL CONTROLLED GaAsFET DOWNCONV...$109** Crystal controlled version of tuneable TVC-2G board used in repeaters or unattended operation with wide temperature variations or at a public service event where a tuning knob might be touched by unauthorized persons. Specify input frequency (421 to 440 MHz) and output (ch 3 45 or 70 MHz IF). Req. +11 to 15 Vdc @ 50 mA, shielded enclosure N input & F out connectors. 2 freq. add..**$20.** LMB CAB-234 box...**$14**

**TVCX-4** is the TVCX-70 board ready to go in the CAB-234 box .....**$139**
Type N ant. input, F TV out. Two frequency with toggle switch installed....**$169**

**WE ALSO STOCK THE MIRAGE KP2-440, DOWNEAST 900 & 1200 MHz ANTENNA MOUNTED PREAMPS, HIGH FREQUENCY TECHNOLOGY TX1300 FM ATV TRANSMITTER & IF70 FM RECEIVER.**

**BUILDING AN ATV REPEATER?**
Ask for our 8 page ATV repeater application note with info and sources for all the components, site and construction hints. Read this app note before you spend your first buck and do it right the first time.
**ATVR-4 ATV Receiver** crystal controlled in a die cast aluminum box. Two composite video outputs, line and speaker audio outputs. Req. 13.8 Vdc @ 300 ma. Specify input frequency - 439.25, 434.0, 426.25 MHz most common.....**$319**
**ATVR-9** for 910.25 or 923.25 MHz...**$329** **ATVR-12** for 1241.25, 1253.25 or 1277.25 MHz...**$349**
**RTX-70** 1.5 Watt ATV repeater transmitter in die cast box - drives D100ATV-R 90 Watt amp. 421.25 or specify.....**$279**

# KLM and RUTLAND BROADBAND BEAMS FOR ATV

Isopole

**KLM 440-6X** 8.9 dBd gain, 28" boom, vertical or horizontal polarization rear mount. Ideal for point to point, fixed at a repeater or small enough to be portable at public service events to minimize multipath ghosts and get some gain at the same time. Wide 60 degree beam width. All 6 include 50 Ohm balun with Type N female conn.....**$65 delivered UPS surface**
**KLM 440-10X** 11.2 dBd gain, 64" boom, rear mounting H or V. Bigger version of 6X.....**$82del**
**KLM 440-16X** 14.2 dBd gain, 10.5 ft boom, ctr. mtg. full 420-450 MHz BW, rugged.....**$142 del**
**RUTLAND FO22-ATV** highest broad bandwidth15.8 dBd gain,14 ft, ctr. mtg.....**$139 del**

The antenna, coax and tower height are the most important part of your ATV system and deserves your most care and attention. ATV antennas must have broad bandwidth in addition to high gain and low VSWR. Few other antennas work well at both 439 and 421 MHz. The three KLM and one Rutland antennas listed here fit the requirement and have a long history of rugged operation with ATVers. The gains listed have been proven out at VHF/UHF conference antenna measuring contests, they are not marketing hype. All four beam antennas listed here take up to the maximum legal power limit. Balun or matching network with female type N connector is included. We suggest using Belden 9913 (2.6 dB/100') or better 50 Ohm low loss coax or hard line. Belden 8214 (4.2 dB/100') is more flexible and is fine for runs less than 50 feet. Always verify any new antenna system with a RF power meter for less than 10% reflected power before normal transmitting over 20 seconds. Weather-proof all outside connectors.

**AEA 450 ISOPOLE OMNI 3-4 dBd GAIN ANTENNA.** 3.5 ft long, 50 ohm type N,1.25" mast mount.....**$89**
Adjustable from 420 to 512 MHz. Great for portable/ base or R/C applications
**DIAMOND F718 9.3 dBd OMNI** 15' long, F718L=420-430, F718J=430-440 & F718A=440-450 MHz.....**$238**
Great for repeaters, emergency operations centers or home station round tables without having to rotate a beam.

Remember when comparing prices, ours include UPS surface shipping in cont. USA. **5/96**

**HAMS, call (818) 447-4565 now for your complete 10 page catalogue of our ATV products!**

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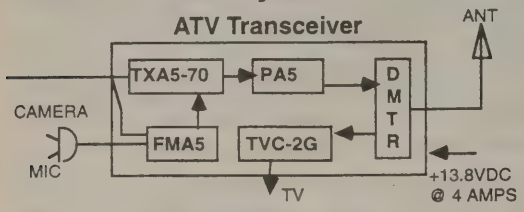
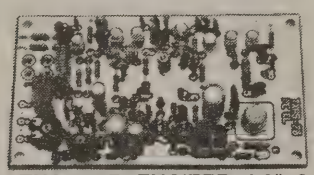
# BUILD YOUR OWN 70 cm 10 Watt ATV STATION

## Basic 10 Watt system - 3 Transmitting modules as seen in the ARRL Handbook




420-450 MHz BAND

See chapters 20 & 7 in the 85 to 94 *ARRL Handbook* or chapter 12 in 1995-6. These modules are the latest upgraded generations. Mount the boards & parts for a 10 to 15 Watt basic module ATV transceiver in a 3x8x12" aluminum chassis for shielding and heat sinking, or Hammond 1590F die cast aluminum box like we did for the TC70-10. Use the DMTR-70-10 module to switch your 50Ω 70cm antenna between PA5 amp and TVC-2G downconverter. Schematic & layout comes with each wired and tested board.

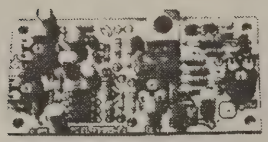


TXA5-70B EXCITER 4.0"x2.25"

**TXA5-70b ATV EXCITER/MODULATOR BOARD.....$89**
Replaces TXA5-5. Smaller board for stand alone portable or R/C applications in addition to 10 Watt systems. Wired and tested board. Adjustable 50-80 mW output to properly drive the PA5 10 Watt module and in turn the 100W 4-110 or D1010N-ATV. Built-in sync stretcher. Accepts standard 1 volt composite video from color camera, VCR, computer, etc. Wideband modulator gives excellent color and high resolution. Draws 70 mA at 13.8 Vdc. One crystal included, but relay switch between 2 sockets. **Extra crystals $20.** We stock 439.25, 434.0, 427.25 & 426.25 MHz, other 70 cm freq. may take 4 weeks to special order xtal. 100 Ohm carbon panel pot for video gain **$5.**

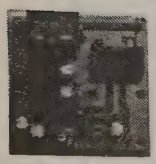
PA5 AMP 3.5"x2.0"

**PA5 10 WATT P.E.P. ATV POWER MODULE.....$99**
An all mode Toshiba S-AU4 is mounted on a heatsink with a stripline PC board to output over 10 Watts p.e.p. when driven by 80 mW from the TXA5-70. 50 Ohms in & out. Broadband, 420-450 MHz, linear, no tuning. 250 mW max RF input, do not use with 1 Watt modules. req. 13.8Vdc reg. @ 3 amps.



FMA5-F SOUND 3"x1.5"

**FMA5-F AUDIO SUBCARRIER GENERATOR BOARD.....$39**
Temperature stablized VCO with adjustable deviation to more than 25 kHz. Transmits broadcast standard sound with your picture. Accepts a Low Z mic (100-600 Ohms), also line level audio from VCRs, camera mics, computers, etc. Up to 1 v pk-pk drive to the TXA5-70, TXA5-RC or TXA5-33 exciter modulators. Works with any transmitter having 5 MHz modulation bandwidth. Req. 11 to 14 Vdc @ 20ma. We can special set freq. for FM or PAL up to 6.8 MHz.



DMTR-70-10 2.2x2.2"

TR-1b 2 x 1.8"

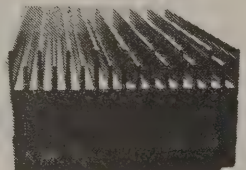
T/R RELAYs

**DMTR-70-10 T/R RELAY, DETECTOR & MONITOR BOARD.....$45**
T/R switching for up to 15 Watt 70cm ATV systems. Negligible insertion loss, 60dB isolation. Mounts on flange type UG58 N chassis jack (**$2**). Relays for switching + power to all basic modules, camera video in rec. to detected output video in xmit. to monitor. 2.2x2.2". 13.8Vdc @ 120 ma.

**TR-1b 70cm T/R RELAY BOARD.....$29**
Simple 15W T/R relay and up to 1A +13.8 power relay. Mounts on UG58

**4-110 RF CONCEPTS 100 WATT P.E.P. AMPLIFIER.....$359**
420-450 MHz all mode: FM, SSB,CW, & ATV. Good color and sound from the 10 Watt basic modules or TC70-10. Sync power (p.e.p.) 100 Watts with blanking set for 60 Watts (6-7 Watt sync, 2-3 Watt blanking set up). ATV duty cycle 10 min on /5 off, other modes 5 on/5 off. RF sense T/R switching. 12x3x5.5". Req. 13.8 Vdc @ 22A. 15 Watts max drive. Receive Preamp.

RFC 4-110 100W AMPs



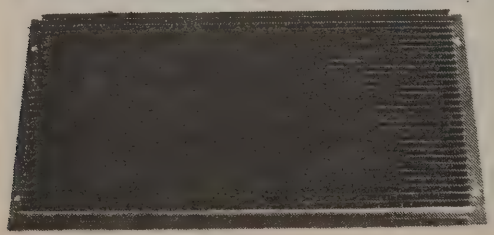
D1010N-ATV or D100ATVN

**MIRAGE D1010N-ATV** similar TX specs as 4-110, req 13.8 Vdc @20A.....**$369**

**D1010ATV-R MIRAGE 70CM REPEATER AMPLIFIER.....$589**
Continuous duty version of D1010N. Made to match TXA5-70/PA5 10 Watt modules. Rugged large heat sink for repeater or long key down time. 100 Watts p.e.p. or 80 Watts CW. 8.75" H 19" rack panel. T/R switch add $35.

**D100ATV-R** repeater version gets 90 Watts p.e.p. for 1.5 Watts drive from RTX-70 repeater transmitter (pg 6) or KPA5. 7 Watts drive maximum.....**$589**

**D100ATVN MIRAGE 1.5 in/>70 WATT OUT AMPLIFIER.....$369**
Designed to match our TX70-1b, TC70-1d, TXA5-RC and KPA5 1.5 Watt transmitters. 7 Watt maximum drive, cannot be used with the 10 Watt modules. All other specs the same as the D1010N.



D1010ATV-R or D100ATV-R

Remember when comparing prices, ours include UPS surface shipping in cont. USA. **4/96**

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# W6ORGy Notes

## *CONTROL IT*

DTMF controllers are handy to have whether you want to remotely open a speaker at home when tuned to a busy repeater so you only get your calls, while mobiling home turn on lights, or adding "whistles and bells" to an ATV repeater. You can get single function boards for about $60 but Motron has their Auto-Kall AK-16 board that has up to 16 outputs and lots of other features for about $100.

Once the basic ATV repeater is up and running, the fun of adding functions can begin. The AK-16 has a special mode (3) for controlling a remote pan and tilt camera. Imagine being able to put a camera on the repeater tower to look out over the country side. You could see storm fronts coming, intruders at the comm site, or what ever might be in view.

Momentary or latched outputs can be connected to relays to switch between the normal ATV receiver input video and audio to a link, weather radar, satellite receiver for Space Shuttle video, computer video, or any other video and audio source by simply hitting the right tones.

I suggest connecting the audio input to the DTMF controller from the primary ATV repeater receiver audio output. This way only an ATVer can change the video and audio output of the repeater and will not violate the FCC rule for primary control only above 222 MHz. I know some ATV repeaters do it anyway, but it is illegal to turn on the ATV repeater transmitter with tones on two meters. The intent is to enable new people who are just starting and don't have an ATV transmitter, to turn on the transmitter and receive with just a video ID for tuning purposes. But this is illegal.

On the board there is a programmable MCW ID if you want to ID on the sound subcarrier instead of, or in addition to video. Actually the cost of one AK-16 board with all its features is less than a single controller plus a CW IDer. The AK-16 also supports X-10 home control modules when used with a TW-523 or PL-513 interface. It can address all 16 house codes and all 16 unit codes. If you use a computer to control various appliances or security in the home instead of the X-10's, there is also a ASCII serial output that can be connected to the RS-232 serial com ports of most computers. This is quite a versatile board with many applications. If you have any questions call them at (503) 687-2118 or email: motron.info@emerald.com

## *SHIELDED OR SLOT ANTENNA*

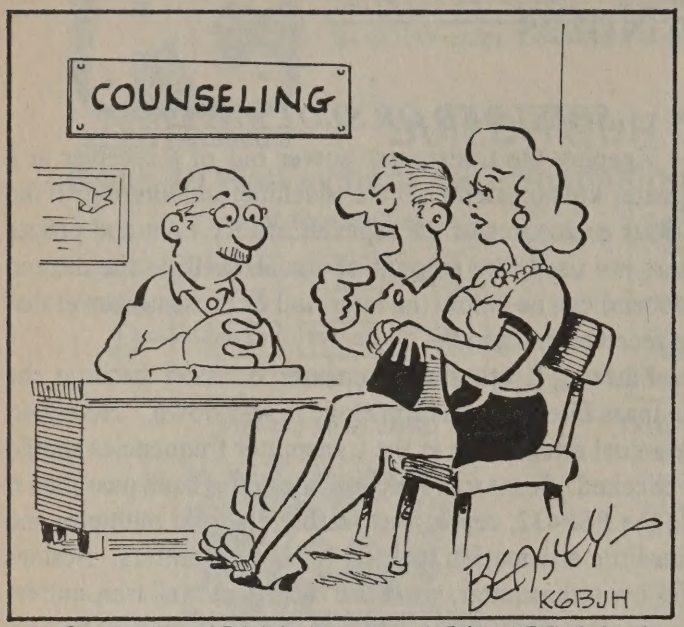
Keeping the transmitter power out of a receiver at a repeater site takes a lot of care, shielding and filtering. If the various enclosures of the repeater are RF tight and proper filters are used, the amount of signals outside the desired passband can be below the intermod or crossmod level that the receiver can handle.

Filtering a crossband repeater is easier because the bandpass filters attenuation slope is way down. However, the actual attenuation at the transmitter frequencies should be checked. Some transmission line broad band pass filters, like the PSF432, repeat the passband at odd multiples and offer little attenuation to 1200 MHz transmitters. Besides ones own transmitter, you have to attenuate all transmitters at a repeater site. If there are just a few transmitters and are not in the same band, you may get away with lower cost broad band pass filters and possibly some lowpass or high pass filters. The low pass and high pass filters found in dual band antenna duplexers are a low cost source - about $60.

The die cast aluminum boxes made by Hammond, Bud, LMB and others are great but may not make good low resistance contact all the way around the cover edges. This is especially true as oxidation builds up in the cracks with age and moisture. It is not a bad idea to take a little steel wool or emery cloth to the mating surfaces of the cover and box during any maintenance routine. Don't forget to blow out the dust before screwing the cover back down.

There may be a gap where the cover does not touch the box in the seam between the mounting screws depending on the alignment of the holes. On the 1590D box for instance the distance between screws, where we know good contact is made, is 3 to 4 inches. At 1200 MHz a quarter wave length is 2 1/4 inches and 3 inches at 900 MHz. If the cover is not making good contact with the box and there is a gap that is a quarter wave length, then this could act like a slot antenna and conduct energy in or out. If this seems to be the problem, you can try a little piece aluminum foil in the slot to break up the gap and make contact.

# W6ORGy Notes




SHE GOT INTERESTED IN MY ATV HOBBY AND STARTED HOGGING THE ON-CAMERA TIME — AND WHAT BUGS ME IS THE GUYS ON THE NET DON'T SEEM TO MIND!

## *CIVIL AIR PATROL ATV*

There has been some discussion whether or not CAP can legally run ATV on the ham bands. Of course there has to be a ham in the aircraft to control the transmitter and at least one on the ground that the transmission is directed to like any of us, but can they use ATV in their normal business? The answer is NO. They have their own frequencies out side the ham band and are a business, although non profit, and are prevented from using amateur frequencies per 97.113. They can use slow scan on their own voice channels and in many cases a still picture is preferred by operations analysts. However commanders like to see real time action video overviews also. So how do they and police and fire agencies get away with doing it? Ah, there is a loop hole - 97.407 - the Radio Amateur Civil Emergency Service.

As long as the organization is a certified RACES group and the transmissions are controlled by licensed amateurs, they can drill up to one hour per week and two 72 hr drills per year. It does not specify exactly how they drill as long as it is to prepare for real emergencies and it is approved by the local civil defense or chief officer of the state for emergency planning. The intent is to practice for real emergencies but not to abuse the priviledge by excessive use or a low cost alternative to normal public safety equipment and frequencies. See 97.407(e)(4) first sentence. Remote damage assessment or command and control video of a crash or incident scene sent back to an emergency operations center is an excellent way to practice for a real disaster which should have no problem being approved by the state or areas Civil Defense or RACES chief officers.

## *FO-22 ANTENNAS*

There seems to be a typo in the F022-ATV assembly instructions which affects those who tune it for the bottom of the band. In instruction #6 it says to cut the T-match wires to 130 mm from the center of the connector. It also says to see figure 4 which shows 135 mm. The driven element pictorial also shows 135 mm. 135 mm is correct, but not a problem for 434 or 439.25 transmission if you went ahead and cut it for 130 mm. If you check the vswr at 426.25, and intend to transmit on that frequency, it could be high and the shorting bars need to be moved outward. Antennas generally need to be set for minimum vswr on the transmitter frequency to prevent finals from taking off.

You can take some vswr in receive with little effect, not so much as to gain, but ghosts depending on the coax length and loss. If you transmit on both 439.25 and 426.25, check the vswr at both frequencies and move the shorting bar to the middle of both minimum vswr locations. Anything at or below 2:1 or 10% power reflected is o.k.

## *23 CM REPEATERS*

A note on 23cm input or output for a repeater. No. California had to go high in and low out because of the Pave Paws radar at Beale AFB in the 420-450 band.

It wipes out any 420-450 ATV receiver on a hill top. The losses and cost of equipment is higher as frequency goes up, so the most efficient for the users is to go in on 400 and come out on 1200 if they do not have the radar problem. 1200 goes 1/3 the distance that 400 Mhz does given the same antenna gains and power, etc. So it is better to put the burden on one repeater owner than all the users. The percentage of people that come into ATV in areas with 1200 in/400 out has been much less, so that while it is easy to watch the repeater outputing on the 420 band with a cable ready TV, the use will not increase unless there are enough people willing to transmit on 1200 to keep it interesting. I only sold 18 23cm transmitters last year...hardly worth it business-wise. In So. California we are all low in and high out which makes it much easier for linking and with almost too much activity.

**73, Tom O'Hara, W6ORG**
**tomsmb@aol.com**

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from

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| PROsat II Display Sub System: | |
| Decoder Board and Software, Model TS-VGA SAT 4 | $249.00 |
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The cost of a complete 137 MHz System is $886.00 ($249 + $637)
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# TC70-10 ATV TRANSCEIVER

**All in one box**

**420-450 MHz BAND**

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**RELIABLE**

**VALUE PLUS**
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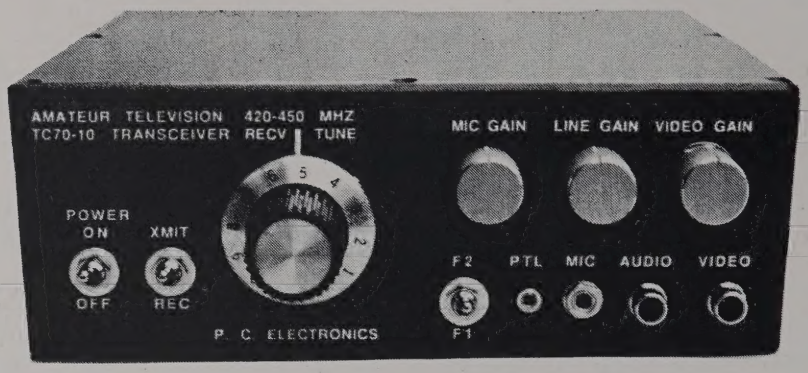
**30 YEARS IN ATV**




**ONLY**
**$499**
**Total price shipped within 24 hrs of your call UPS surface in cont. USA, Visa/MC**

**≥10 Watts p.e.p. Output -Adjustable**

**Made in USA**

## TC70-10 Transceiver lets you get on ATV right away with all the power most will need in one box - *90 Miles line of sight DX

ATV is no more difficult or different than any voice mode except that you also plug in your camcorder to transmit, and your TV set to receive the picture. That's it - you're seeing as well as talking to other hams live and in color! No other radios needed.

You can show the shack, home video tapes, zoom in and describe projects, computer graphics and programs, repeat SSTV or even Space Shuttle Video and audio if you have a TVRO. Go portable or mobile, do public service events, RACES, AREC, CAP, even transmit the radio club meetings to those hams that can't make it out of the house.

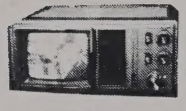
*DX is up to 90 miles snow free line of sight using 14 dBd beams and 100 ft. of Belden 9913 low loss coax.

Transmitting equipment sold only to licensed Tech class or higher Radio Amateurs, verified in the Callbook, and used for legal purposes per 47 CFR part 97. If newly licensed, moved or upgraded, mail or fax a copy of your license or test certification.

- Adjustable peak envelope power RF output
  Typical range from 2 to ≥10W and sync stretcher allows proper adjustment to fully drive the RF Concepts 4-110 or Mirage D1010-ATVN to full 100 Watts p.e.p., without sync or audio clipping.
- Separate mic and line audio volume controls
  Allows voice over commenting when showing video tapes.
- Rugged 7.5x7.5x2.7" black die cast alum. box
  Continuous duty for public service applications. Takes up less space on the operating table than 1 Watt plus amp. 3.5 lbs.
- True Final RF detected video monitor output
  lets you set the video gain control for actual white level in your video monitor. Camera video is at this phono jack during receive for focus & lighting set up before transmitting.

Front panel phono jacks accept composite video and line audio from your camcorder or VCR. Mini jack for low Z dynamic mic & submini PTT. Type N antenna jack on rear panel. Sensitive GaAsfet downconverter tunes whole 420-450 MHz 70cm band down to your TV channel 2, 3 or 4. Comes with one crystal you specify on 439.25, 434.0, 427.25 or 426.25 - F1. 2nd switch selectable crystal, F2, add $20. Requires 13.8 Vdc @ 3 Amps. 100% duty cycle.

## COMPLETE 420-450 MHz 70cm BAND ATV STATION



Your TV set

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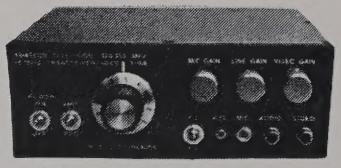

**TC70-10....$499**
**ATV Transceiver**
**10 Watts p.e.p. min.**
**Downconverter tunes 420-450 MHz**
**Req. 13.8 Vdc @ 3A power supply**
**Specify transmit frequency(s):**
**439.25, 434.0, 427.25 or 426.25 MHz**

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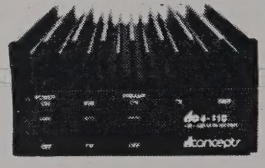

Optional 100 Watt Amplifiers

**RF Concepts 4-110.....$359**
**Mirage D1010-ATVN ...$369**
**Req. 13.8 Vdc 25 Amp pwr supply**

+

Antennas - see page 5

| | | | |
|---|---|---|---|
| **Rutland FO22-ATV** | | **15.8 dBd** | **$139** |
| **KLM** | **440-16X** | **14dBd** | **$142** |
| **KLM** | **440-10X** | **11 dBd** | **$82** |
| **KLM** | **440-6X** | **8.9 dBd** | **$65** |
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